ELECTRICAL WORLD

Engineering Library

OCTOBER 22, 1932
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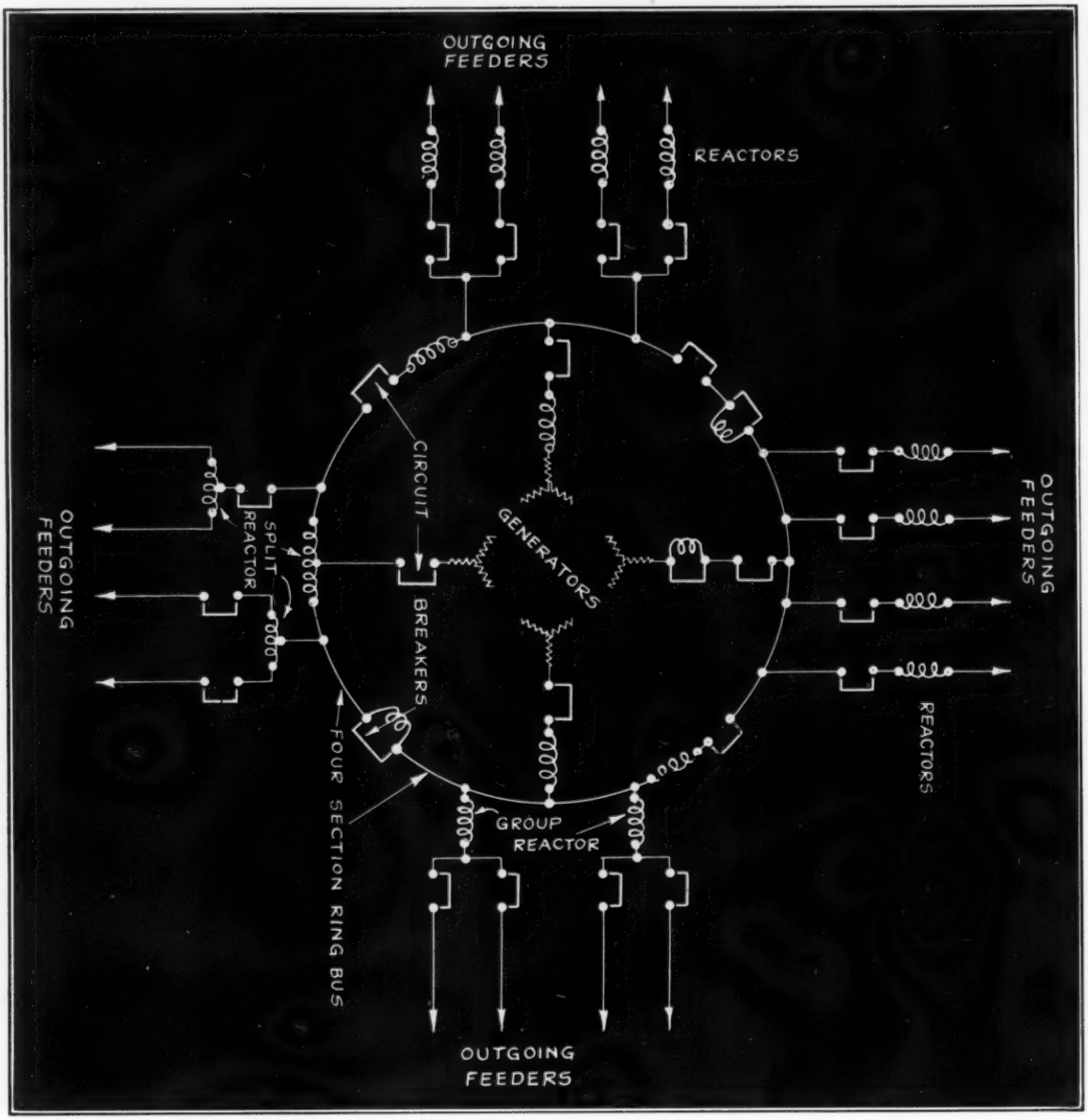
OCT 25 193

From copper ore . . . mined half a mile underground . . . to finished wires and cables for every electrical requirement.

ANACONDA WIRE & CABLE COMPANY

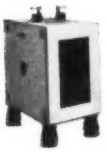


The Most Frequently Encountered Reactor Arrangements Are Shown in the Above Diagram

MURRAY Low Loss* Reactors

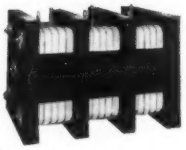
Designed for every system requirement

Outdoor reactor



Type T feeder reactor

Open type station reactor



Three phase reactor

METROPOLITAN DEVICE CORPORATION

1250 Atlantic Ave., Brooklyn, N. Y.

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ELECTRICAL WORLD

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October 22, 1932

Insull Remains in Greece; Stock Auction Ban Lifted

Steadfastly refusing to yield his passport for cancellation as requested by the United States Consul in Athens at the instigation of the State Department, Samuel Insull appears prepared to await the outcome of any legal proceeding to insure his return to the United States. Mr. Insull, in writing to the American Cousul, has contended that:

"Because a genuine citizen is transformed by his own country, against every sense of its obligation, into a scamp who can neither stay anywhere nor go anywhere, withdrawal of a passport is equivalent to withdrawal of citizenship. Therefore it is unnecessary for me to add that I cannot recognize your right to cancel my citizenship by surrendering to you my passport before its expiration."

Most sensational of recent developments is the rumor that, unable quickly to secure Mr. Insull's extradition from Greece, a kidnaping plot has been formed to spirit the ex-utility executive to a country from which he might more readily be reached by legal process. The alleged plot was revealed to press representatives in Athens by Mr. Insull.

The two Assistant State's Attorneys from Chicago who were to have started this week for Greece to begin extradition proceedings there against the obdurate traveler have postponed such action until more adequate documents for action may have been prepared.

Auction restraint lifted

Judge Lindley's restraining injunction which has, since last May, prevented New York banks from selling large blocks of Insull operating company stocks, pledged as security for loans to Insull investment holding companies now in receivership, has at last been dissolved by action of the United States Circuit Court of Appeals in Chicago.

This court's action does not, however, open the way to immediate disposal, for an ancillary restraining order was granted by the District Court in New York and the banks have been ordered to show cause why they should not be restrained from selling the securities pledged with them.

The banks are interested principally in the decision of the Court of Appeals, as it affects the case of a judge issuing an order restraining an action in a locality far removed from his jurisdiction. Judge Lindley's orders as they affected the instrument known as a "collateral loan agreement" threatened to invalidate a document developed over a period of decades. The reversal of these orders, which was anticipated by the banks, has been more important to them than the mere fact of proceeding with the suspended auction sales.

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Under the stimulus of research, invention and engineering, business is now moving into the unknown with unparalleled rapidity. Unless the processes of the law are correspondingly quickened the distance between them will increase.

We are experiencing now some of the disasters to a national credit structure which rests on the banking laws of forty-nine different sovereignties. There is no use talking about economic planning unless you provide either in advance of it, or contemporaneously, legal planning.

OWEN D. YOUNG,
Chairman of the Board
General Electric Company.

[Mr. Young told members of the American Bar Association last week of their part in integrated progress in the engineering era.]

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Rhine Development Dedicated

Formal dedication of the first unit of the 200,000-hp. Kembs development on the Rhine River was made last week by Albert LeBrun, president of the French Republic. This first unit also serves navigational purposes clearing the Rhine from Rotterdam to Basle. There will be eight units in the completed project (ELECTRICAL WORLD, July 16, page 73).

▼

Electric Workers Strike, Facing Cut in Wages

Rather than accept $12 a day for their wage, workers in Group 1 of the Electrical Contractors' Association of New York walked out on a "friendly" strike this week. The wage in effect has been $13.20 and the new scale negotiated by union officers and employers was rejected by union members.

A wage of $9 a day for alteration and similar work contributed to the dissension as it was claimed that "alterations" was a vague designation and that the whole scale could be reduced under certain interpretations.

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Belgian Station Wrecked by Lubricating Oil Fire

Due to the leakage of lubricating oil upon high temperature surfaces or upon low-voltage conductors which short-circuited near a turbine the generator room of the 57,000-kw. Brussels, Belgium, municipal power station was destroyed by fire early this month. Service to the city was interrupted for some hours in the section served by this plant, but resumption was effected through emergency ties with other Brussels power enterprises.

At the time of the accident but one 9,000-kw. unit was in operation and the fire started, according to reports, at an end pedestal from which oil had been leaking. As ignition occurred a screw plug in the oil pressure lubricating system blew out and the lubricating oil, shooting out under 60 lb. per square

inch pressure, ignited. The flames quickly destroyed the generator room and the roof of the quarter-century-old structure collapsed; damage to the switch gallery and boiler room was limited. The loss is estimated at between one and two millions of dollars. The machines themselves were so little damaged that operation of some, at least, may be resumed shortly.

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Electragists at Kansas City Meeting Assume Original Name

REVERTING to the old name under which it was organized 31 years ago, the Association of Electragists, International, by unanimous vote of the members at the annual meeting in Kansas City, Mo., last week, became the National Electrical Contractors' Association. The trademark of "Electragists" will be retained for use with the association title as identification of membership in N.E.C.A.

Warning against accepting work at ruinously low prices was given by President L. E. Mayer of the association, who pointed out that "owing to the retarded building activity there seems to be a zealous desire on the part of the electrical contractor to obtain business irrespective of the fundmentals of sound business, selling his services to the consuming public for cost or below cost, and in each instance praying that some inevitable situation will occur that will warrant additional work, wherein he may be in a position to take up the losses developed in the signing of the original contract . . . all of us should reflect on the conditions that are bound to develop from this form of business practice and refrain from competing with such unreasonable competition that ultimately will be the ruination of our business."

President Mayer also took the opportunity to point to the perils of slackened wiring standards, referring specifically to non-metallic surface extension wiring and concentric wiring, in the case of the latter stating, "notwithstanding the fact that it is considered a hazard and mechanically imperfect."

Trade policy committee

Seeking a remedy for some of the ills besetting the contracting industry, the trade policy committee offered a plan for consideration involving action by the National Electric Light Association, local utility companies, National Electrical Manufacturers' Association, National Electrical Wholesalers' Association and the N.E.C.A. Essentially, the plan calls for co-operation, support of the code, market problem study and support, fairness by outside bodies, and, for N.E.C.A.: Urging contractors and dealers to recognize the fundamental economy underlying the established channels of distribution; recommending the adoption of such protective measures as sales control ordinances, quality surveys and approval bureaus; influencing the passage of legislation to prevent bid peddling on public work; maintaining an untiring struggle to defeat onslaughts now being directed against the integrity of the National Electrical Code; prevailing upon the other groups in the industry to abandon such practices as customer competition, indifference to trade relations, credit abuses and the promotion of sub-standard materials, and promoting the ideal that the branches of the industry are interdependent and that enduring benefits can materialize only by acceptance of this principle.

Merchandise survey reported

Results of an electrical merchandising survey among members were reported upon by a special committee. This showed that contractor-dealers accounted for 22.9 per cent of the sales, utilities 28.4 per cent, chain stores 12.7 per cent, department stores 12.0 per cent, hardware stores 13.7 per cent and other outlets 10.3 per cent.

The merchandising committee made a number of recommendations for the betterment of conditions, including a plan which calls for the acceptance of the initiative by the utilities to insure that: All electrical appliances offered for sale shall be of such manufacture as to assure safe and dependable service; the utility should recognize as the proper retail cash price of any appliance an amount that allows the contractor-dealer (selling at that price) a gross profit not less than is customarily obtained from its discount on such item; no premiums or trade-in allowances unless all agencies are offered participa-

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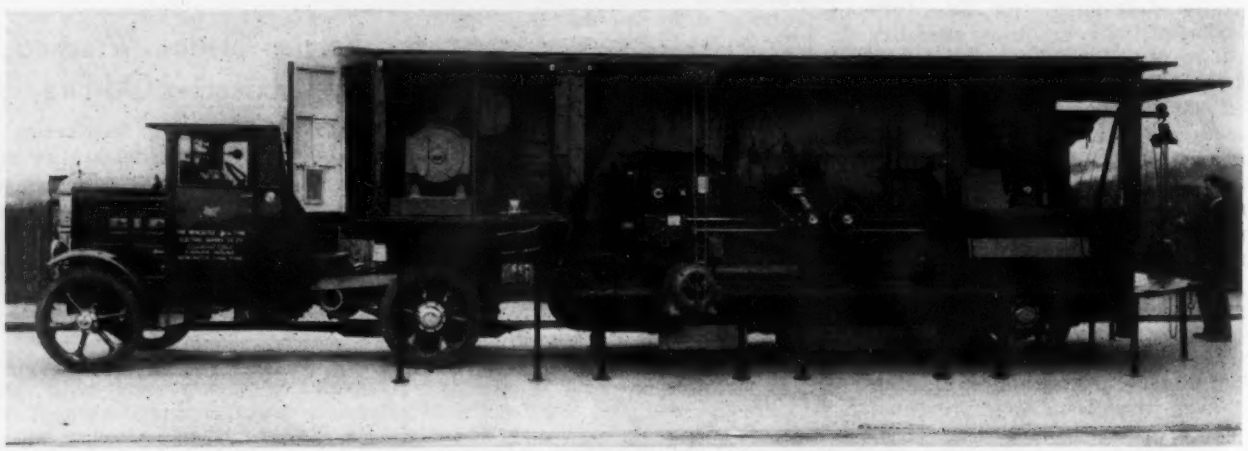
They Take the Shop to the Job in England



Frequency standardization in Northumberland and Durham counties and the North Riding of Yorkshire in England has necessitated considerable shop work in the conversion of customers' equipment. Rather than bring the apparatus to a central shop for conversion work the Newcastle-upon-Tyne Electric Supply Company, Ltd., has adopted a number of motor truck-trailer units of the type illustrated. These are driven to factories, collieries, and other large power users whose equipment must be modified and the work done at the customer's premises. Equipment includes gasoline engine and generator, lathe, grinder, keying machine, radial drill, shaper and crane.

tion at the expense of the utility; coordinated advertising, down payments to permit of fair competition; salesmen to be compensated on the basis of total added load from all added load and not from individual sales; utility to segregate all merchandising accounts from sales accounts.

Other topics at the meeting were discussions of the code and of the uniformity engendered by it and changing methods and polices in distribution.

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G.E. Sales Off 45 per Cent From 1931 Figures

Sales billed by the General Electric Company for the first nine months of 1932 amounted to $113,049,474, compared with $206,138,967 for the corresponding period last year, a decrease of 45 per cent, Gerard Swope, president of the comany, announced this week.

Orders received by General Electric for the first nine months of 1932 amounted to $94,374,114, compared with $202,700,016 for the corresponding period of 1931, a decrease of 53 per cent.

Profit available for dividends on the common stock for the first nine months of this year was $9,726,395.22, compared with $30,753,850.14 for the first nine months last year. This profit is equivalent to 34 cents per share for nine months of 1932 and $1.07 per share for the corresponding nine months of 1931 on 28,845,927 shares outstanding in both periods.

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Clarion River Costs Ordered by U. S. Supreme Court

That the Federal Power Commission has authority to determine the "actual legitimate investment" of power companies in hydro-electric projects built under federal license and to require the companies to conform their books to the commission's findings was the decision of the U. S. Supreme Court this week dismissing a petition for a writ of certiorari filed by the Clarion River Power Company against the commission.

The Clarion company obtained a 50-year license under the federal water-power act, completed its project in Pennsylvania and filed a statement asserting that it cost $11,000,000, but the commission's accounting division recommended the elimination of about $6,000,000 and put the cost at $4,645,000.

When the Power Commission set the matter for hearing, the Clarion company sought an injunction, but the District of Columbia Supreme Court dismissed the bill and the Court of Appeals upheld that decision. The company had argued that the commission lacked power to determine the investment cost unless the government proposed to acquire title to the property when the 50-year lease expired.

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Holding Companies Topic at Bar Association Meeting

Led by a scathing denunciation from a member of the Interstate Commerce Commission the critics of the holding company told some of their grievances at the annual meeting of the American Bar Association in Washington last week.

Commissioner Joseph B. Eastman of the Interstate Commerce Commission urged the American Bar Association to "probe deeper" into this subject and to consider not only regulation, but the creation of such companies, and to "follow back the evil to its very sources."

"In my humble judgment the holding company, working with its ally the dummy or convenience corporation, has been one of the most effective instruments of exploitation which this country has known," said Mr. Eastman.

"Under certain conditions and properly limited and safeguarded, there may be a legitimate place for such corporations," he continued, "but when instead of a reasonably simple corporate structure one finds a tangled maze of pyramided and interlacing companies, many of them strictly of the holding or dummy type, it requires no great amount of intelligence to know that some process of evasion or concealment or perversion is under way.

"Furthermore, the creator or architect of every such corporate labyrinth is bound to be some clever legal shark. In this manner the lawyer becomes the hand-maiden of exploitation."

Cabot urges control

When utilities profits are above normal, "regulation should aim not to reduce the profit but to promote more rapid expansion," Philip Cabot, professor of public utility management, Graduate School of Business Administration of Harvard University, told the public utility section of the association.

"Owners and managers," he continued, "are often shortsighted and are content with a high rate of profit which limits the business, deprives their customers of service and the owners of the opportunity to invest more capital."

"When this situation occurs," he added, "regulation should intervene to cure their shortsightedness."

Professor Cabot argued against cutting public utility rates in time of depression. He said that utilities almost alone have withstood the panic and by so doing have helped to avert a complete rout."

Business Drifts Upward in Pre-Election Calm

LACKING either strong influences or indications of trends which would swing business activity sharply upward or downward, the drift is slightly upward. Commodity prices showed rallying abilities late last week and early in this one. Security markets which had slumped badly rallied and then fell off again. Trading on the New York Stock Exchange fell below a million shares a day in a market variously estimated as 90 and 75 per cent professional during the past week or so.

Car loadings continue to show gains, although at a reduced rate, and electrical energy production leads in a similar manner.

The chill which quadrennially strikes the heart of America as rabid partisans foresee the dissolution of civilization, of society and the nation if their candidate be not elected may be sensed once more. A safe guess would be that it mattered little one way or another and that the sooner we all settle down to our own tasks the better. Some one has said that the only essential difference between Republican and Democrat is that the word Republican comes from the Latin, while that for Democrat comes from the Greek.

Photo-Cells Reduce Costs in Printing Industries

Both lower production costs and greatly curtailed time requirements have resulted in the printing and publishing industry from photo-cell applications and developments. Those attending the meeting of the New York Electrical Society this week heard of accomplishments of varied and convincing nature. Outstanding applications as cited by O. H. Caldwell, editor of *Electronics*, are: automatic machine setting of type from typewritten copy, halftones made by photoelectric scanning and without acids, control of accurate register on web presses, control of trimming, stops in the case of paper breakage, counting, matching colors, measuring glare and opacity of stock, detecting vibrations, and safety guards. Halftones may now be made by inexperienced office help in five minutes, said Mr. Caldwell.

Instruments which will measure color values in terms of a known standard with an accuracy as great as one-twentieth of one per cent were described by E. B. Lyford of the American Photoelectric Corporation. The accuracy of the human eye is said to be about 2 per cent at best, so that this instrument is about forty times more sensitive.

Counters which will record units on paper traveling at a linear speed of 600 ft. a minute were described by A. H. Lamb of the Weston Electrical Instrument Corporation.

Coming Meetings

National Association of Practical Refrigeration Engineers—Annual meeting, Chicago, Nov. 1-4. E. H. Fox, 435 No. Waller Ave., Chicago.

N.E.L.A. Residential Sales and Industrial and Commercial Sales Bureaus. Edgewater Beach Hotel, Chicago, November 2-4. C. E. Greenwood, 420 Lexington Ave., New York.

National Association of Railroad and Utilities Commissioners—Hot Springs, Ark., Nov. 15-18. James B. Walker, 270 Madison Ave., New York.

American Society of Mechanical Engineers—Annual meeting, New York, Dec. 5-9. C. W. Rice, 29 West 39th Street, New York.

American Association for the Advancement of Science—Annual convention, Atlantic City, N. J. Dec. 27-31. C. F. Roos, Smithsonian Institute, Washington, D. C.

American Physical Society—Annual meeting, Atlantic City, Dec. 28-30. W. L. Severinghaus, Columbia University, New York.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 23-27. H. H. Henline, 33 West 39th Street, New York.

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New Hampshire Court Defines Commission Jurisdiction

The recent decision of the Supreme Court of New Hampshire sustaining the Associated Gas & Electric interests in their control and operation of the New Hampshire Gas & Electric Company (ELECTRICAL WORLD, October 8, page 482) brought out several important points in regard to the jurisdiction of the Public Service Commission of the state which are of interest in the present status of holding company activities. The court found that the statutory test of the laws bearing upon commission jurisdiction over utility contracts providing for transfer of franchise or the right to own and operate is the control and operation of the enterprise. If this control is to be surrendered under any form of contract, the consent of the commission is required. In this case the court held that the commission is without authority to make the order disapproving the management contract.

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Westinghouse Sales Off 33 per Cent This Year

Westinghouse Electric & Manufacturing Company reports that for the nine months ended September 30 sales billed were $58,875,094, against $87,853,736 in the same period last year. Orders received totaled $54,857,938, against $105,821,203 in 1931.

Net loss for the nine months was $5,917,250, comparing with a net loss of $966,709 for the nine months ended September 30, 1931.

The company had cash, including marketable securities at current values, of $30,784,779 on September 30, comparing with $31,828,053 on December 31, 1931. Inventories on hand and outstanding receivables have been liquidated to the extent of $8,302,022 and stood at $57,978,126 on September 30. Total current assets, after payment of $2,472,109 in cash dividends in the nine months, totaled $88,762,906 on September 30, with current liabilities only $4,459,903, a ratio of 19.9 to 1, compared with 13.8 to 1 on December 31, 1931.

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Utility vs. Customer Costs Debated by A.I.E.E. Group

Asserting that "the utility group has felt for many years that the portion of the electrical system beyond the service switch has not received the engineering treatment that the system ahead of the switch has received," H. R. Searing, general superintendent distribution operations, New York Edison Company, pointed to one of the causes of misunderstanding between utility and contractor groups at the meeting last week in New York of the power group of the New York section of the American Institute of Electrical Engineers. Mr. Searing further stated: "Experience has shown that this part of the system does not receive as good maintenance as that part for which the utilities are responsible. There has been a tendency on the part of consulting engineers and contractors therefore to install a much higher grade system in the fond hope that the lack of maintenance will not cause as much trouble as poor maintenance would cause on a cheaper system. There has been considerable exploitation in this field by selfishly interested parties, including portions of the manufacturing, contracting and regulatory groups."

Whose costs are high?

Reducing to simple terms the opposing viewpoint of those who feel that all is not said when the utility viewpoint has been presented, Allan Coggeshall, president Hatzel & Buehler, Inc., contractors, told the audience that "the electric utility companies have for some time past been engaged in building and operating roadways, electrical roadways if you please, from their generating stations to the customers' premises. By and large, these roadways have been well constructed and well maintained and they are a credit to the industry. They have not, however, been cheap to construct, and apparently they are fairly expensive to operate and maintain. We are willing to pay a just and fair pro rata share for the use of the highways provided only that we have enough left so that we don't have to employ dirt roadways on our own premises. That would be too high a price to pay and I don't believe we'll pay it. Certainly not without examining the facts a bit further first."

Competitive Power Problem Before Pacific Coast Men

Acute consciousness of the competitive power situation, a militant attitude toward the inroads of "gyp" and "shyster" lamp and lighting equipment sales rackets, a determination that power rate schedules must be formed in terms more easily sold to the public and a keen interest in the range and refrigerator campaigns of the industry marked the two-day sessions of the first conclave of the Pacific Coast Electrical Association, commercial section, held at San Francisco, early this month.

An outgrowth of field experience in combating the threats of lost load to gas engines was expressed unanimity of opinion that the present types of demand rates, with minimums based upon horsepower connected, must be revised. The executive committee of the commercial section petitioned utility managements, through the association, to hold individual company conferences between rate department engineers, accounting department executives and commercial department executives, particularly in the agricultural field, for the purpose, not of reducing rates, but of revising their form so that they may be more readily sold and justified to power users.

P. M. Downing, vice-president and general manager Pacific Gas & Electric Company, and chairman of the National Sales Section, N.E.L.A., declared that rate reductions, although demanded nowadays, are impossible to grant until greater sales of load bring them about naturally. Another force acting upon utilities to force rates to even lower levels is competitive power. Greater efficiencies, more sales and, as a result later, more power development, must contribute to this public benefit of lower rates, stated Mr. Downing.

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Trade Problems Occupy Great Lakes Conference

Although various aspects of the sales problem now confronting electric utilities accounted for eight topics and employee information activities for only one on the program of the Conference of the Great Lakes Division, N.E.L.A., at French Lick recently, it was in the latter that those present appeared most interested. George B. Cortelyou, national president, and S. B. Way, president of the division, discussed it, the latter citing employee information as being as big a factor in successful electric utility operation as engineering. From the discussion emerged the conclusion that it is impossible to expect employees to absorb and retain the large quantities of information and data that

are given to them in meetings and by other means. But the result of information activities should be and can be a conviction in the employee's mind that the company he is working for is a good citizen and is not engaged in any conspiracies against the peace and well-being of its fellow citizens.

From the standpoint of what those who attend could and did get out of it, this Conference of the Great Lakes Section was probably the most successful meeting that the division has had in its history. Unfortunately an appearance of exclusiveness was given to the meeting by calling it an "Executive Conference," with the result that the attendance was much less than it should have been in consideration of the value of the sessions.

Business ahead

Some specific things brought out in the discussions were these: The power salesman has a harder job now than he ever had to get new business, and while he is doing this he must also hang onto existing load in the face of increasingly powerful competition. It is a mistake to be complacent about what has been accomplished in the sale of electric refrigeration and to say that the refrigerator has public acceptance when 80 per cent of the electric utility customers who might have electric refrigerators are still without them. It will be a long time before the farmer can look for profit in rising land values; he must find his profit today in operating his farm and the electric utilities are committed to a large part in making farm operation profitable.

No other class of prospective load holds out such immediate promise of increasing domestic load factor as does water heating and utilities should go after that load on an off-peak basis at a rate sufficiently low, 1 cent per kilowatt-hour or possibly even less to be attractive to the customer, it was pointed out. Utilities cannot sell electric ranges successfully until utility people themselves are convinced by actual experience that an electric range is really a better means of cooking. And finally, and most important, it is time for combination gas and electric utilities to realize and act on the fact that the electric range cannot be suppressed.

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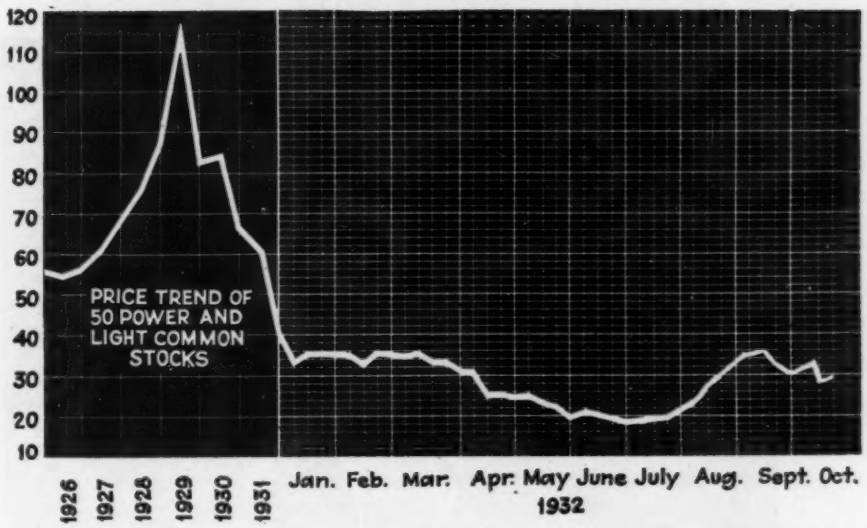
Stronger Control Urged by Federal Power Head

The present status of the power business is practically a compromise between the driving force of private initiative and the guiding force of public regulation, George Otis Smith, chairman of the Federal Power Commission, told the listeners-in to the National Radio Forum last week.

"It is rank nonsense to talk or even think of divorcing business and government," said Mr. Smith. "The two have lived together these many years, and their separation would be the height of absurdity; the weight of evidence points the other way, for today an even closer union is demanded by economic conditions. State regulation has not broken down. Expansion of the industry has forced the enactment of the federal law and the strengthening of many state regulatory statutes. Eight states, however, are without regulatory laws.

"In the power situation today," he said, "there are conditions that call for some revamping of the regulatory laws."

Stocks Move Slightly Upward



Trading during the past week was rather dull, prices moving within narrow boundaries. A mixture of gains and losses in the electric light and power stocks carried the "Electrical World" index up to 28.8, as compared with 28.1 last week.

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Pennsylvania Security Act Applies to Utilities

While the Pennsylvania Securities Commission has no authority to regulate the issuance of securities, the state law on the subject applies to public service companies to the same extent that it applies to other entities, according to an opinion from the state Department of Justice, written by William H. Neely, Special Deputy Attorney-General.

"The Securities Commission," states the ruling, "has no authority to regulate the issuance of securities. However, it may investigate any such issue in the hands of dealers, to determine whether fraud has been or is being practiced in the offering and sale of the issue to the public. If such fraud is found, the commission may forbid any further offerings or sales of the securities by the dealers.

"Employees of public service companies, when selling securities of their employers, under certain conditions, need not register as salesmen under the act. However, such salesmen are in all other respects subject to the same restrictions and penalties and the same supervisory power of the commission as registered salesmen."

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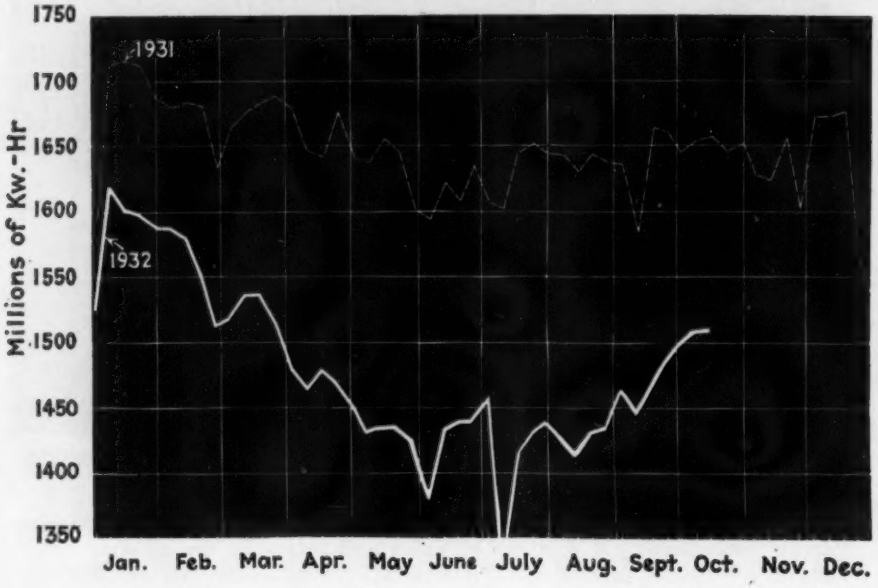
Bond & Share Censure Vote Fails as Stockholders Meet

Minority interests failed in their attempt to have a resolution passed at a stockholders' meeting last week disapproving the action of the management of the Electric Bond & Share Company in its offering of stock to executives and other employees. The situation was explained to the stockholders in a statement, "Why a Sound Plan Failed and Was Repealed," some time ago (ELECTRICAL WORLD, May 14, page 839). Though defeated in the attempt to secure a censure vote, it was stated that objectors would probably file suit to test the legality of the cancellation of the plan.

At this meeting the stockholders voted to increase the number of directors of Bond & Share from nine to fourteen and after re-electing the present board voted for the five new ones.

Bond & Share's report to the stockholders as of September 30, just released, showed, for the twelve months ended September 30, $21,577,185 for gross income, $7,371,680 available for common-stock dividends and $4,180,701 as income chargeable to surplus, against for the twelve months ended June 30 for the same purposes, $23,821,214, $9,131,776, and $4,071,710 respectively.

Output Rise Continues



ENERGY output of electric light and power plants for the week ended October 15 is reported as 1,507,503,000 kw.-hr. by the National Electric Light Association. This is a slight increase over the preceding week, despite the occurrence of a more or less widely observed holiday. Output remains 9.0 per cent less than in 1931, the difference being very nearly the same as in the two preceding weeks.

Regionally also the comparison with 1931 has lately shown no important changes except in New England, where a steady climb has been going on. Production in that section is not only almost up to last year's, but apparently well in excess of that of 1930. This is the best showing for any section of the country; in contrast, output for the United States as a whole is 13 per cent less than in 1930. In all regions the gain since midsummer is pronounced.

Weekly Output, Millions of Kw.-Hr.

Week Ended	1932	1931	1930	1929
October 15	1,508	1,656	1,729	1,799
October 8	1,506	1,653	1,724	1,806
October 1	1,499	1,646	1,711	1,819
September 24	1,491	1,660	1,714	1,778
September 17	1,476	1,663	1,722	1,792

Per Cent Change from 1931

Region	Week Ended Oct. 15	Oct. 8	Oct. 1
Atlantic Seaboard	— 4.7	— 4.4	— 4.2
New England alone	— 0.2	— 2.4	— 1.6
Central industrial	—11.3	—10.8	—11.1
Pacific Coast	— 9.4	—10.1	— 8.6
United States	— 9.0	— 8.9	— 8.9

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Taxless Town Claims Challenged by Data

Statements recently circulated by the Public Ownership League of America picturing, as an actuality, the operation of sixty-eight towns and villages, largely in Oklahoma and Kansas, without any tax levies, all operating expenses being met by profits from municipally owned utilities, have been sharply challenged by Thorne A. Browne, director of the Middle West division of the N.E.L.A. Mr. Browne has checked up or caused to be checked up the reports of most of the municipalities listed in his section of the country.

"As a rule these towns have higher rates," says Mr. Browne, "and, with the usual few exceptions, the claim of 'no taxes' is without basis. What is evidently meant is no taxes for the general fund. In brief, what almost every one of these towns is doing is to substitute for the direct property tax levy a form of sales tax."

In the data compiled by Mr. Browne is a tabulation certified to by the director of the Oklahoma Utilities Association as being accurate in all respects. In excess of seventy Oklahoma towns and cities in which municipal plants are being operated or where there is municipal distribution are listed, and the rates charged in each are compared with cities or towns of similar size in that state served by private companies. General operating conditions are the same in each comparison. This is made on the basis of net charges for 50 kw.-hr. monthly consumption, and where room rates are applicable on the basis of a five-room residence. These figures show that the average monthly net bill for the municipal plants is $5.41 and for the municipal distribution plants $6.24, while that for the public utilities is $4.03.

Alabama Legislators Consider Utility Laws

The ways and means committee of the Alabama Legislature has adversely reported upon a bill sponsored by Gov. B. M. Miller which would have levied a tax of two-fifths of a mill on each kilowatt-hour of hydro-electric power manufactured in the state and sold outside of the state, or *vice versa*. Such a levy is now collected on power produced and sold within the borders of the state. The committee acted almost unanimously following an earnest plea by Thomas W. Martin, president of the Alabama Power Company. He said 94 per cent of the company's gross earnings are now being paid out in operating expenses, taxes and fixed charges, including dividends on preferred stock.

After passage by the House, a bill to give preferred-stock holders equal voting privilege with common-stock holders (ELECTRICAL WORLD, September 24, page 386) has been killed by the Senate judiciary committee of the Alabama Legislature.

In the general election of November 8 Alabama will vote on a state income tax which would levy a 7 per cent tax on the earnings of all corporations, including electric utilities. Opponents freely predict the income tax proposition will be decisively defeated.

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City-Unit Basis Argued Before Indiana Commission

Indiana's Public Service Commission has decided to advise operating utility companies that annual reports for 1932 should recognize the city-unit basis of accounting rather than the system basis. Formal notice will be given that the practice of ignoring commission regulations for detailed annual reports will no longer be tolerated.

An effort to explode the reasonableness of using the city as a unit for establishing electric rates, as determined in the Martinsville case, has been made by officials of the Public Service Company of Indiana. This developed at a recent hearing when the Public Service Company of Indiana endeavored to establish a system-wide current rate to replace the present system, which gives various towns served by the company different rate structures.

Contention of the company was that the so-called "south system" is a single unit despite the fact that it serves a number of municipalities. The interlocking nature of the system is such that it is impossible fairly to allocate different rates to the various towns within the system, according to company officials.

Lamp Costs Compared by Customs Commissioner

To illustrate how many foreign countries, by reason of their low wages and depreciated currency, are able to overcome the high tariff duties of the United States, F. X. A. Eble, Commissioner of Customs, has presented to a Senate committee an exhibit of 300 articles which are imported at prices below the cost of production in the United States. Of interest to the electrical industry were the figures covering ordinary incandescent lamps and Christmas tree lamps.

According to Mr. Eble's presentation it costs $3.72 a hundred to produce a 60-watt incandescent lamp in this country for the domestic consumer, while the Japanese product of similar rating may be landed in the United States at a cost in our currency of $3.12 a hundred. In the case of Christmas tree lamps the cost to produce in this country is given as $2.35 a hundred. The Japanese product may be landed here for $0.73 a hundred.

Senator Reed of Pennsylvania, chairman of the special Senate committee studying a plan to overcome the effect of depreciated currencies upon tariff duties, pointed out that it was almost impossible in many cases to devise a means of protecting American labor against the cheap cost of production abroad, and that in his opinion tariff rates must be adjusted to overcome the depreciation in currency by fixing the value at par of the depreciated currency rather than at the exchange rate.

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Electrical Inspectors to Study Fire Causes

Methods of studying fires and their causes with a view to securing better and more accurate knowledge of the subject were discussed at the eighth annual convention of the International Association of Electrical Inspectors in New York recently. About 300 delegates and guests attended the meetings.

A manual for the standardized investigation and reporting of fires due to electrical sources was presented by V. H. Tousley, secretary of the international organization. The plan involves ascertaining, wherever possible, that type of construction in building and electrical equipment most productive of fires. It is hoped that from such a standard classification of data will evolve information which will enable recognition of conditions likely to cause fires and which will permit their correction before the fire actually occurs.

The manual asserts that a lack of personal investigation of many fires, or the study of fire reports now available, has resulted in a "lack of appreciation by many inspectors of the number of fires probably due to electrical origin."

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Rural Extension Rules Modified in New York

Modified plans which will permit the New York State Electric & Gas Corporation to extend its lines into a large rural area have been approved by the Public Service Commission of that state. The plans provide that the company continue to build lines under its regular extension plan, where there are five or more customers per mile, when these prospective customers meet the conditions set forth in the tariff schedules of the company. The present limitation is only two customers per mile.

The company proposes to formulate an extension program based on the date of application for service and a construction budget which will clearly define the extensions proposed to be included in each six months' program, which will be submitted to the commission for approval twice each year. These programs for single-phase line extensions will be carried out and lines constructed for customers who have complied with all the conditions and requirements in the company's tariff. Customers on single-phase line extensions agree to pay minimum monthly charges amounting to 49½ cents gross, or 45 cents net, per 100 ft. of total extension.

In cases where the number of prospective customers is less than five per mile of extension the company will make the extension if the customer or customers to be served advance to the company the estimated cost per mile of extension. Refunds will be made by the company the first of each year in an amount equal to one-half of the total revenue received from the extension during the preceding year until the full amount advanced has been repaid. Interest on unrefunded balances will be paid at the rate of 6 per cent per annum. Complete refunds will be made within ten years.

The company previously filed plans requiring all customers, regardless of the density of lines, to advance the cost of the lines. This plan was disapproved by the commission (ELECTRICAL WORLD, September 10, page 324).

Major New Construction This Week

MOTORS, controls, panelboards, conveyors, etc., will be installed at Fredericksburg, Va., transparent wrapping cellulose plant of Sylvania Industrial Corporation. Cost, $130,000.

Three 2,200-hp. waterwheel-generators, switchboard, instruments, crane, transformers, transmission lines and substation equipment needed for hydroelectric plant of Curtis Power & Light Company on Des Moines River, near Croton, Iowa. Cost $600,000.

Motors, panelboards, cable, conveyors, etc., will be installed in new garment plant of Kops Brothers, at Ozone Park, N. Y. Cost $150,000.

Heavy-duty motors, electric hoists, conveyors, etc., will be installed in plant of Valley By-Products Coal Company, Charleston, W. Va., on Big Kanawha River. Cost over $50,000.

Transformers, accessories, pumping equipment, heavy-duty motors, regulators, air compressors and conveyors required for refinery to be constructed by Donleon Oil Company, Oklahoma City, Okla. Cost about $100,000.

Motors, regulators, panelboards and conveyors needed for plant of Keystone Lubricating Company, Philadelphia, Pa., manufacturer of oils and greases. Cost about $140,000.

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Delinquent Electrical Accounts

(National Electrical Credit Association)

Number of Accounts Reported

Division	September 1931	September 1932	Per Cent Inc. or Dec.	Nine Months 1931	Nine Months 1932	Per Cent Inc. or Dec.
New York	161	222	+37.9	2,146	2,179	+ 1.5
Middle and Southern Atlantic	97	62	—36.1	1,079	964	—10.7
New England	100	65	—35.0	841	910	+ 8.2
Central Division	428	389	— 9.1	5,045	4,141	—17.9
Total	786	738	— 6.1	9,111	8,194	—10.1

Total Amounts Reported

New York	$17,388	$20,205	+16.2	$276,315	$191,502	—30.7
Middle and Southern Atlantic	10,089	4,493	—55.5	137,006	86,911	—36.6
New England	10,654	4,936	—53.7	74,846	71,304	— 4.7
Central	40,403	20,234	—49.9	458,461	293,536	—36.0
Total	$78,534	$49,868	—36.5	$946,628	$643,253	—32.0

New York Metal Prices

	Oct. 11, 1932 Cents per Pound	Oct. 18, 1932 Cents per Pound
Copper, electrolytic	6.25	6.25
Lead, Am. S. & R. price	3.00	3.00
Antimony	5.625	5.625
Nickel ingot	35.00	35.00
Zinc, spot	3.40	3.40
Tin, Straits	24.10	24.40
Aluminum, 99 per cent.	23.30	23.30

City Negotiates for Winnipeg Plant

Tentative negotiations between the city of Winnipeg and the Winnipeg Electric Company for the purchase by the municipality of the company's interests have been resumed. A year ago, when the negotiations were initiated, President Edward Anderson named $24,000,000 as a sum on which considerations might be based. The amount of $14,000,000 was named for some portions of the company's assets, not including railway interests.

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Copeland Exports Up

Without indicating just what previous figures were, or what present exports may be, it is announced by H. M. Robins, export manager of Copeland Products, Inc., that the export sales of Copeland electric refrigerators for September increased 73 per cent over those for August and 25 per cent for those of the corresponding month last year. The gain is reported to cover eleven widely separated countries.

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Seattle Loan Not for Power

Though the Reconstruction Finance Corporation has agreed to purchase $1,491,000 of the revenue bonds of the city of Seattle there is no relief involved for the municipal power plant, for which aid has been so persistently sought (ELECTRICAL WORLD, September 24, page 391). The money is to be used for improvements in the water-supply system of the city.

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Central West Receivership Dismissed

Receivership suit filed against the Central West Public Service Company of Chicago has been dismissed by Chancellor Wolcott in Chancery Court, Wilmington, Del. All parties agreed to the dismissal when it was stated that the company has successfully completed refinancing its funded debt of $1,000,000 due last August and had paid all past due obligations. It was held that the company was no longer insolvent (ELECTRICAL WORLD, September 10, page 326).

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General Electric Shareholders

Stockholders of the General Electric Company as of September 30, 1932, numbered 178,579, an increase of more than five thousand in the third quarter of the year and a gain of more than 38,800, or 28 per cent, over a year ago. Since 1925 there has been an uninterrupted increase in the number of General Electric shareholders. On December 31, 1925, there were 35,707, or but one-fifth as many as at present. The number of new stockholders for the year ended September 30, 1932, is larger than the entire number of stockholders in 1925.

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Indiana Rate Reductions

Orders by the Indiana Public Service Commission have been issued directing the Indiana General Service Company to reduce rates in nineteen communities in that state. They are said to have been agreed to by officials of the utility company. It is estimated that the reductions ordered will save the average domestic consumer about $5 a year.

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New Zealand Hydro Plant

Largest hydro station in the Southern Hemisphere, that of the Waitaki development on the river of that name on the South Island of New Zealand, will probably be in operation before long. This station will contain five 17,000-kw. generating units. The plant will serve three provinces and will be interconnected with three other power projects. The cost has been estimated at approximately $10,000,000.

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Canadian Tariff Changed

Under the provisions of the new tariff which went into effect last week in Canada the duty on electrical goods imported into the Dominion from other countries will continue to bear an impost of 30 per cent. The preferential tariff on imports from Great Britain, formerly 15 per cent, has been changed to admit British goods duty free. Last year Canada imported nearly $5,000,000 of electrical equipment, mostly from the United States.

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Central Public Service

About 19,000 security holders of Central Public Service Corporation and its subsidiaries are reported to have acceded to the reorganization plan made effective in August (ELECTRICAL WORLD, August 27, page 257). Approximately $51,000,000 of stocks, bonds and notes have been submitted for the readjustment plan. This represents about 50 per cent of the bond issues, one-third of the stocks and one-fourth of the short-term notes.

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Mitchell, Neb., Votes Municipal

At a special election early this month the voters of Mitchell, Neb., decided overwhelmingly in favor of municipal operation of the power system. Western Public Service Company now supplies the community. Its distribution lines are to be acquired through exercise of the right of condemnation.

Missouri's 10 per Cent Law

Motion for a rehearing on a recent decision of the Missouri Supreme Court (ELECTRICAL WORLD, October 8, page 484) holding unlawful an order of the state Public Service Commission granting a foreign corporation authority to acquire more than 10 per cent of the capital stock of a Missouri utility was filed today with the court by attorneys for the commission.

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India's Largest Plant Started

Operation of the first generator in the $22,500,000 Joginder Naggar headworks of the Mandi hydro-electric project in the Uhl River valley of India began on October 3. The Mandi development, started in 1926, will ultimately supply 47 towns, including Delhi and Simla. A 2¼-mile tunnel through the 9,000-ft. Dhaola Dhar range, bringing water from the Himalayas, took three years to build. The first part of the project will probably be completed early in 1933.

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Chats Falls Project Completed

Installation of the last of the eight generators at the 224,000-hp. Chats Falls development of the Ottawa Valley Power Company has been completed and this organization, now controlled by the Calgary Power Company, is prepared to deliver energy to the Hydro-Electric Power Commission of Ontario according to contracts in force for 96,000 hp.

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Cambridge, Mass., Rate Cut Opposed

Contending rates for electrical energy in the territory served by the Cambridge Electric Light Company to be the lowest of any company in Massachusetts because of its 5 cents a kilowatt-hour and "because we don't have a minimum charge," counsel for the company opposed a customer petition for a reduction of rates at a recent hearing before the Department of Public Utilities. The company, having but recently cut the charge from 5½ to 5 cents, also seeks a reasonable time for the new rate to prove itself.

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Station Named for Comerford

New England's largest hydro-electric plant, the 215,000-hp. station at Fifteen-Mile Falls on the upper Connecticut River, will hereafter be known as the "Frank D. Comerford Station," in honor of the president of the New England Power Association. The association is following the policy adopted when the largest station of the Deerfield system was named in honor of Henry I. Harriman, formerly president of the association.

Reservoir Control of Pumps at Baltimore Water Works

Probably the largest completely automatic water-pumping plant to have been built, the 50,000,000-gal.-per-day Guilford station of the Baltimore Water Works incorporates complete protective features including over-current, reversed phase due to reversed wires, serious unbalance of current or voltage in the system and bearing temperature and pressure cut-out. In the event that one unit is taken off the line due to the development of a fault the unit is locked out until attention is received and the load transferred to the next unit automatically.

The governing of this plant is most unusual. A pump in service continues to run until the reservoir is within 3 in. of being full. When the level is reached a valve controlling the flow of water into the reservoir is closed, automatically resulting in a few pounds increase in the pressure of the entire system. This rise in pressure is limited by a small overflow standpipe at the reservoir, but the increased pressure is sufficient to cause a pressure relay at the pumping station to make a contact and initiate the shut-down operation of the control equipment.

When the shut-down indication is given a timing clock begins to operate and after the end of the predetermined time interval for which the clock has been set, depending upon the season of the year, a contact is made which again places the pumping unit in service. The clock at the same time is shunted out and performs no further timing function until the unit is again stopped. Other features incorporated by Westinghouse engineers make this station unusual.

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New Gaseous Light Source Is Energized by Induction

Wide World

Characterized as an inductively energized lamp, a new form of gaseous discharge source suitable for television, therapeutics, sunlamps, photography, floodlights, motion-picture projection and similar purposes has been demonstrated at the Myers Electrical Research Laboratory in New York.

The lamp there shown, which is said to generate 250,000 cp., creates light by the disassociation of the mercury atom, accomplished by placing the lamp within a copper coil through which a high-frequency current circulates. In operation the lamp is so lacking in generated heat that it may be held close to the hand without any sensation of warmth. The lamps vary in size from 1 in. in diameter to about 2½ in. The efficiency of the new lamp, according to Elman B. Myers, the inventor, is so high that about 20 cp. may be produced for each watt of energy used.

"We can develop these tubes to produce 1,000,000 cp.," said Mr. Myers, who was a radio tube pioneer, "and at that brilliancy the bulb will be about 100 times as efficient as an ordinary incandescent lamp. We plan to cast television images on a theater-size screen and expect no difficulty because we have plenty of light. The tube in use in our receiving set has been in operation 7,000 hours and we can build tubes of that size for $10.

"We propose to build a high-power television transmitter rated at 10,000 watts and also television-equipped trucks that will flash scenes back to the main station for relay to theaters. We are also designing tubes to replace the arc in motion-picture projectors."

Electrical Group Dedicated at Chicago World's Fair

Shaped like a huge sickle, 1,200 ft. long and 300 ft. wide, embellished with electric fountains, cascades, hanging gardens and terraces and designed to house exhibits showing the tremendous advances in the electrical industry since the pioneer days of Faraday, Morse, Marconi and Edison, the electrical group of buildings for Chicago's 1933 Century of Progress was dedicated on October 12. The dedication program was under the auspices of the Electric Association of Chicago, with its president, W. O. Batchelder, in charge, and with the co-operation of the Chicago Engineering Council.

B. E. Sunny, trustee of the Century of Progress, and who was also a trustee of the Chicago Fair in 1893, delivered the dedicatory address. He spoke of the part that the then infant electrical industry had played in the '93 fair in comparison with the one now in preparation. In '93 a total generating capacity of 3,400 hp. supplied electricity for what was then a tremendous electrical display.

It is expected that the Century of Progress will have an electrical demand in the neighborhood of 40,000 hp. Just as the Columbian Exposition gave to the public at large its first conception of the possibilities of the incandescent lamp, so it is expected the Century of Progress will give a tremendous impetus to the developing art of electrical illumination and display by means of gaseous discharge tube lighting.

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Complete Time Control for Machine Operations

Production engineers visiting the demonstration at the Chicago Lighting Institute last week are reported pleased with the promise of control and efficiency of machine operations embodied in the new Graybar "chronolog." Said to combine the principles of the adding machine, the chronometer, the electric clock and the mechanical calculator, it was stated by George W. Cossman, secretary of the Chicago Association of Commerce and sales manager of the Graybar Electric Company, that "the chronolog will drive the slacker out of industry. It practically ends the production losses which have resulted from one machine turning out less work than another, causing disruption of factory schedules and adversely affecting the piece-work earnings of certain types of individual plant workers.

"This product of machine wizardry can be attached to any machine existing and will keep a good account of what happens."

EDITORIALS

L.W.W.MORROW
Editor

The Domestic Market—All Talk and No Sales

"I HAVE heard talks about the domestic market for the past ten years. At each convention addresses are made giving complete data on this market. Each year a new plan or program is promulgated for an industry sales campaign. Each year I hear about the possibilities of lighting, electric cooking, electric water heating and electric refrigeration. Yet we make very little progress. With the exception of the refrigeration campaign, each plan turns into talk and not sales. Why don't we get the business instead of talking about it all the time?"

This is a typical comment of executives in both the manufacturing and utility branches at this time. It is a truthful comment, a logical inquiry and deserves an answer. Progress is very slow, there is much talking and little selling, and the industry is not gaining much ground in its competition for the consumer's dollar. For example, many interested in the present range campaign say there is a great amount of promotional talk, but no business organization is available to even attempt to follow through and sell ranges. Also in connection with air conditioning and water heating there is much discussion, a great deal of research and very little selling. Even the old reliable shelf appliances are decreasing in sales volume. Thus, in general, sales pressure is at a low point.

THERE are several reasons given for the present doldrums in domestic sales. Sales codes, expensive wiring, anti-merchandising legislation, lack of consumer-purchasing power, the high cost of financing dealer paper, high utility rates, no money for sales or advertising—these are typical topics for long and active discussions, and some of these factors undoubtedly have an influence in creating the present low levels in sales.

But the true reason lies deeper. Little progress is being made in selling because the industry fails to face the facts or to act as a unit in using the facts to create merchandising methods and organizations that can be put to work to sell service and appliances to the homes.

MANUFACTURERS of appliances are still seeking a business policy and organization. They are playing with this and that idea of merchandising; they are striving to beat out a competitor, usually by a price cut; they are focussing on the development or sale of this or that appliance and neglecting all others; they are discussing new and theoretical organizations and policies at their headquarters instead of investigating the facts in the markets, and they will not commit themselves to the necessary monetary obligations to do a real advertising and sales job. This condition is not unusual, but it is particularly acute at this time. It is evident that despite years of experience either no sound policy and organization principles have been established or conditions beyond their control prevent aggressive selling.

Utilities fumble about with equal ineptitude. Agitation for anti-merchandising legislation has caused a cessation in utility sales pressure; a desire to develop dealer outlets usually has taken the form of slowing down their own sales; some stop selling all but the so-called heavy-duty appliances; all are under pressure to keep the merchandising departments "in the black"; economy moves have forced a smaller advertising appropriation and a

decrease in sales staffs. Executives and commercial managers are favorably disposed to selling, but they are still trying to develop sales plans that will prove to be economical and they will not make commitments as to money and men necessary to force sales by simply using high-pressure sales methods. Analogous conditions exist with jobbers and dealers. Not in years has there been so little agreement as to what to do to build up sales organizations or so little actual sales pressure in the marketplace.

What can be done? On a national scale it should be possible to agree upon and fix definite policies and to approve and institute some proved merchandising organizations. A joint committee of experienced men should be able to survey the situation, investigate and act upon policies and practices that have been tried and found effective and at the same time put back of current sales programs the organized and unified business thought and effort needed to change present sales conceptions into commercial successes. Also in each local area it should be possible for regional joint committees to parallel this national work so that direct sales action will be had along tried and approved lines in each regional and local market. The only way to sell is to go after the business according to methods that both experience and good judgment indicate to be sound and economical.

Insull—investors—rate payers

THE Insull trusts have crashed. His vast enterprises grew beyond his control and made him their victim under stresses created by depression conditions. This Insull debacle has been seized upon by critics of the industry as justification for all the charges made against electric utilities, whether as to rates, monopoly privileges, holding company operations or security issues. With great glee the political vultures are attacking the dead lion and eagerly seek other prey.

Time will be required to bring out the facts in detail, but it is clear that the chief reason for the failure resulted from Mr. Insull's attempt to support the market for his investment company securities in the face of waning confidence caused by the unforeseen depths of one of the worst depressions in world history. It is also certain that it is the investors in these Insull securities and not the rate-paying customers on Insull properties who have suffered losses. *Rate payers were not bled to pay the exorbitant rates that would have been necessary to create large cash reserves back of the investment company securities sufficient to have withstood the market drop.* This was not the Insull financial policy; rates were based upon the annual financial requirements for paying the normal interest and dividend charges on operating property securities. Customers have paid low rates during the growth of the Insull properties and have suffered no losses in service or in dollars as a result of the Insull investment company failures. Operating properties and operating property securities are unchanged in status or essential values. Only the top holding and investment companies were struck to earth, and they dealt in finance and in security issues and not in kilowatt-hours and electric rates.

These facts should be made clear to the public. The only connection between the utility business and this failure is that unsound holding company financing policies were practiced, with the result that thousands of investors in holding company securities suffered losses. The industry should know the true story and the public should learn it—all should combat the wild statements that rate payers or operating properties paid or will pay the bill.

Operating properties of light and power companies are sound. They are furnishing good service at rates determined by the cost of service and the competitive market and are not affected by holding company securities. The managers of these properties are fully aware of their responsibilities to the public and to their security owners and are attempting to lower their rates as rapidly as possible consistent with a high standard of service in order to expand their market and compete for a larger share of the consumer's dollar.

Utility holding companies, on the other hand, are of all types and kinds. The majority are sound and have weathered the storm successfully. All have learned how to conduct their business more successfully and more conservatively. But the investment and financial aspects of holding company failures, with the Insull crash as the "horrible example," should not be misrepresented and distorted to prove that electric rates are too high or that state regulation has failed to control conditions on operating properties.

Taxation Ad Lib. vs. Utility Economy and Progress

By S. B. WAY*
President Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

Levies for mounting government expenses gobble up benefits from technical advances and from economies of management that should be used to reduce rates and to improve employee compensation. Effect of taxation on utility credit.

INDIFFERENCE to the amount of money spent by federal, state and local governments and to the manner of its spending is incomprehensible. In times of prosperity even heavy taxes can be met without great pain and suffering, but in times of adversity the destructive hand of excessive taxation makes itself manifest. Taxation has been termed "the science of securing the most feathers with the least squawk." The process of plucking the goose has been going on apace for years, but now that the proportion of feathers being taken constitutes such a high ratio to the total number the goose is beginning to squawk. It is important to the welfare of all citizens that this squawk, like the shot at Concord, be heard around the world.

Utilities have for many years, but especially during recent years, constituted shining targets for the many taxing bodies which use them as tax-collecting agencies. The fact that utilities are generally large concerns, are comparatively few in number and admit of segregation and classification, makes it possible for taxing authorities to levy special forms of taxation, oftentimes devoid of any basis of principle except that of obtaining more revenue with minimum squawk.

One large utility with which I am familiar affords illustrative statistics. In the year 1931 this utility was required to pay 14½ cents out of every dollar of its gross revenue as direct taxes. This, of course, means that direct taxes took all of the proceeds of the company's operations for one day out of every seven, or its total revenue for more than 7½ weeks out of the year. These taxes do not include special expenditures incurred by the company because of street and road widening, change of grades and other municipal improvements requiring the company to remove equipment long before its useful life has been exhausted and replace it with new equipment in a new location. Were these and other indirect and more or less invisible burdens added to the sum total of direct taxes the total period out of the year for which the company's gross revenues are appropriated for taxes would exceed at least two months. Rapid increase in taxation of utilities prevails throughout the country. Recent N.E.L.A. statistics show that during the last eighteen years the percentage of revenues paid by privately operated electric utilities has approximately doubled, and that in 1931 it amounted to 10.6 per cent.

The electric utility business celebrates its fiftieth anniversary this year. Its record of achievement in this half century is outstanding and unequaled in the annals of the world, as contributing to man's material and social well-being. When the industry began operation its unit investment was high and its operating efficiency low. Practically all operations, including the stoking of furnaces, was accomplished by hand labor. In 1902 the average coal consumption per kilowatt-hour was 6.7 lb. In 1931 this average had been reduced to 1.5 lb. Besides, in this period the greater part of the back-breaking, slavish labor involved in the production of electric energy has been eliminated. The outstanding increase in thermal and labor efficiency achieved in the electric utility business has been of the utmost economic importance to the consumers of the utility's service, as well as to the country at large. These increased economies have by no means been confined to the electric utility business, although that business has blazed the way for scientific development. They have been appropriated by railroads, steamships, manufacturing establishments and even by governments. While the past is chronicled with these marvelous engineering accomplishments on the part of utility engineers, the fruits of these accomplishments are being rapidly appropriated by the tax gatherers.

Taxation versus utility efficiency

The utility of which I speak has a coal bill approximating $2,500,000 a year, and you will be astounded to know that its tax bill amounts to nearly $4,225,000. It is discouraging to managements to see the economy contributed by engineering achievements robbed of its effectiveness by these ever-increasing taxes. Management would far rather resolve these economies into lower rates for the benefit of the consumers. Behind this growing tax burden on industry can be plainly seen the fantastic development of governmental functions. Good authority indicates that the Congressional Directory lists 43 boards and commissions of various sorts, including the National Screw Thread Commission and the Federal Co-ordinating Agencies, the latter to prevent the numerous commissions

Portion of address to Engineering Section, Great Lakes Division, N.E.L.A.

and bureaus from obstructing one another's paths or treading upon one another's toes.

In pursuing our efforts to serve the public efficiently, we find it more and more difficult to move without jostling tax assessors, various commissioners, examiners and other public agents, or tripping over rules and regulations of bureaucratic origin and becoming entangled in the meshes of official red tape.

Utility taxation adversely affects customers

In the company from which illustrative data have been taken taxes apportioned on a proper basis between electric utility and other services indicate that the average price per kilowatt-hour of electric service sold has had to carry a burden of ½ cent to meet the various tax levies. Notwithstanding this heavy burden of taxation, the average price paid by residential customers of this utility shows a decrease of 43 per cent since 1914. N.E.L.A. figures show that in 1931 taxes paid by privately operated electric utilities of the nation amounted to 34 per cent of the total revenues derived from domestic electric service.

The total revenues from domestic electric service in the United States amounts to only 4.85 per cent of the total expenditure of federal, state and local governments in consuming the $14,000,000,000 of taxes assessed or collected in 1931. Hence it follows that if a 5 per cent decrease in these governmental expenditures could be achieved the saving would be more than the sum total of all the annual electric service bills of the 20,000,000-odd domestic customers in the entire country.

Our electric utilities rank high among the larger employers of the country, both as to the number of employees and as to stability and quality of employment. The danger of excessive utility taxation is driven home when it is figured out what this taxation means per employee. In 1931 the tax paid by the company used as an illustration amounted to 55 per cent of the total utility payroll in that year. The number of employees involved was nearly 5,500 and the amount of taxes paid per employee was the impressive sum of $769. The total number of employees included a substantial number engaged on construction. Since construction is a variable and is now largely out of the picture, it is fair to compute the tax burden in terms of operating employees. In making this computation it is found that the total taxes paid amounted to $1,040 per operating employee. If you relate these two figures to the average wages earned per employee, the effect of taxation upon the ability of the utility to pay wages is clearly seen.

Taxation as it affects credit

Utilities, as well as other large corporations, must, of necessity, go to the people to procure the money with which to finance the large expenditures required for construction. People who invest money, be they bondholders or stockholders, are primarily interested in the safety of their investment and in the prospect of earning a reasonable return consistent with the risk assumed. In the case in point, but using twelve months figures for the period ended July 31, 1932, instead of for the calendar year 1931, it is found that taxes required 56 per cent of the total sum available for interest and preferred and common dividends and surplus. Taxes during this period equaled 1.15 times the bond interest and were 2.45 times the preferred stock dividend requirements.

From all sides and all quarters we hear complaints concerning taxtion—and justly so. I have ventured to discuss this matter with you engineers because you represent a field of endeavor peopled by men of far more than ordinary intelligence. Most of you are leaders or directors of groups of workers of varying size. The forces which you direct look to you consciously or unconsciously for inspiration and guidance. The specter of confiscatory taxation looms large. Its devastating influence, if it continues unchecked, will not only destroy your business but all business. You are interested in your own behalf and as leaders of various groups in arousing public opinion to the necessity for tax reduction, which means less government spending. It is important that the man who believes himself tax free should recognize that, after all, taxes are finally paid by any one who eats or has a place in which to live or buys goods of any kind.

One difficulty with our system of taxation is that it fools the people. Many dwell in a fool's paradise, believing that only the so-called rich or those holding real and personal property, in tangible and accessible form, pay taxes. Many do not realize that excessive taxation dries up sources of employment and promotes directly that most terrible situation for the workingman—unemployment. All this which has been said is not intended in any way to disguise or set aside the fundamental fact that we must not ignore our duty to support the reasonable and essential costs of government by taxation. It is equally our duty, however, to insist that government waste, duplication, extravagance and unnecessary competition with its own citizens cease in the interest of preserving our liberty. The people must be educated in the maxim that it is impossible to get something for nothing.

Many believe it is advantageous to induce governmental agencies to spend large sums for alleged public improvement. A park located in one place will promote a demand for a similar park in another place. A new post office in one town precipitates a flood of demands for similar expenditures in others. The list of illustrations might be multiplied endlessly, but these are sufficient.

As American citizens and engineers, we have proved our capacity to visualize, plan and construct in the scientific field with outstanding success. Can we not align ourselves with our fellow citizens to bring about a clearer understanding of the menace of super-taxation, procure sensible and reasonable adjustments and thereby insure our future progress and prosperity?

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Hydro Progress in Austria

Austrian water-power installations in operation or under construction at the end of 1930 aggregated 869,540 kw., according to statistics recently issued by the Federal Ministry of Commerce. Sixty-nine per cent of the total is in public utility plants. These figures apply only to installations of 500 hp. or larger.

New construction and expansion has multiplied the turbine capacity in public utility plants sixfold since 1918, railway traction plants eightfold, and has increased that of private industrial plants by 50 per cent. Of the

15,000 km. (9,500 miles) of high-tension transmission line about 80 per cent has been constructed since 1918. Lines up to 20 kv. comprise 75 per cent, 20 to 60 kv. 15 per cent, above 60 kv. 5 per cent, 55-kv. single-phase railway transmission lines 5 per cent. Line materials are copper 82 per cent, aluminum 11 per cent, iron 5 per cent, bronze 2 per cent.

During 1929 and 1930 turbine capacity increased 70,000 kw. In the former year 800 km. (500 miles) were built and 1,000 km. (620 miles) in 1930. Thus far the large public utilities have succeeded in compensating the losses due to the industrial crisis by expanding domestic and agricultural consumption.

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Cuts Out Regulator Without Breaking Circuit

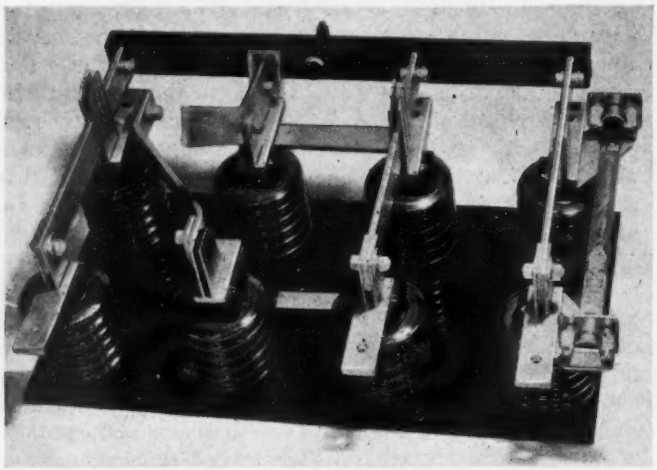
A single-phase induction-regulator cutout switch by means of which a regulator may be removed from service without interruption of the regulated circuit has recently been developed and constructed by the West Penn Power Company. The outstanding advantages claimed for this switch are: (1) Reliability of operation (practically 100 per cent and quite safe); (2) investment required is somewhat less than $100 per regulator erected and wired in place (this is said to be less expensive than any other scheme, especially methods involving oil switches whereby it is possible to remove the regulator from service without an interruption to the regulated circuit); (3) maintenance costs are probably not more than $5 per year; (4) space requirements are not more than 10 cu.ft. including some percentage of the wiring, and (5) structure support costs about $10.

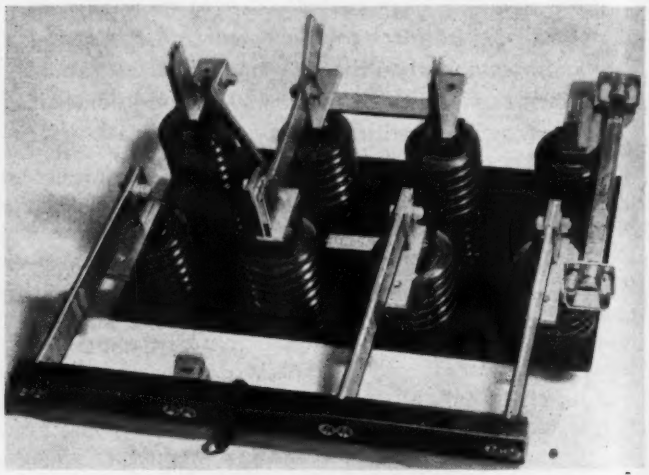
Compared with almost any other arrangement providing the same facilities the following are approximate percentage comparisons reported by H. A. P. Langstaff, electrical engineer of the company:

Possibly 75 per cent more reliable, especially as compared with an oil circuit breaker and interlock arrangement.
At least 75 per cent less investment required.
At least 60 per cent less maintenance costs.
Approximately 80 per cent less space required.
Eighty per cent less structure support.

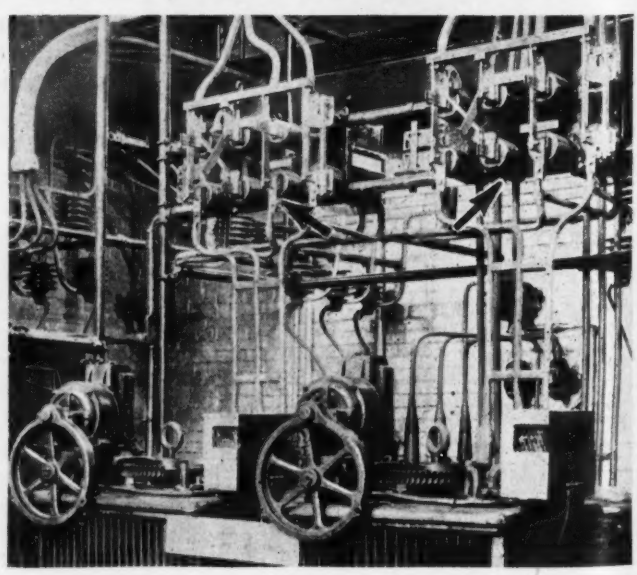
The accompanying illustrations show the switch separately and installed, while the diagram shows connections of two of these cutout switches controlling two single-phase regulators on a three-phase three-wire circuit.

Four-pole, single-throw specially connected switch in closed and open positions

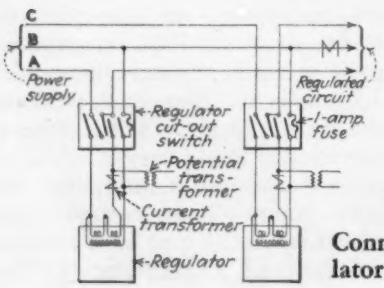




The three blades on the left, namely, 1, 2 and 3, provide for opening and shorting the series circuit through the regulator. The first few inches of travel of the blades short circuits the series coil by way of blades 1 and 2 and continued travel shunts the potential circuit through the low current-capacity fuse, the blowing of which opens this potential circuit, thereby preventing an exposed arc. The fourth blade, or the one on the extreme right, is in parallel with the potential fuse when closed. The upper jaws on blade 1 are somewhat extended as compared with the others, thereby preventing the opening of the potential circuit in any way other than by blowing the fuse. Before opening the switch it is thought best that the regulator be set on the neutral position, but this is not absolutely necessary.



Installation of two cut-out switches showing space requirements, structure supports, etc.



Connections of regulator cut-out switch

Economics of Boiler and Turbine Maintenance

By C. D. ZIMMERMAN
Assistant Superintendent of Production, Ohio Edison Company, Akron, Ohio

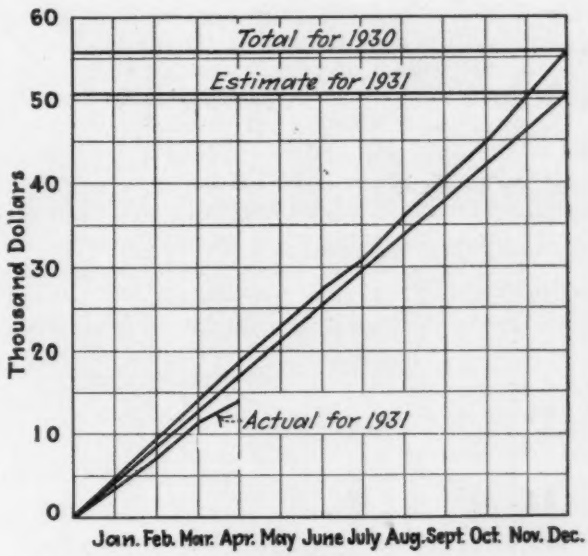
Lowest production costs result from a proper balance of emphasis on plant efficiency and low maintenance expense.

PERIODIC inspections and tests to an extent and at a frequency determined by operating conditions are the best insurance of low maintenance costs in the modern steam-generating station. Minimum maintenance expense results from study of the balance between fuel and repair costs. Studies of repair costs alone, that do not take fuel expense into account, often lead only to penuriousness, which is followed by vicious cycles of forced outages, poor efficiency and high overall plant costs. Control of outages in time of occurrence and duration is greatly aided by adequate inspection systems and operating schedules that while rigid in their requirements are yet capable of revision as events and changed conditions may demand.

Routine inspections and study techniques that express the combined experiences of operators and manufacturers have resulted in very good control of operating continuity of main turbine units. Inspection of machines of standardized type consists of close observation of the last-stage wheels once a month and complete inspection of all stages and internal parts once a year, or even less frequently, if the machine is operated under exceptionally good conditions. Where machines are operated for long periods at less than half load complete internal inspection should be made at least once a year, and more often if signs of wear or fatigue are noticed. Machines of newly developed types or those operating under unusual conditions should receive more frequent inspection in accordance with the conditions met. Lubrication conditions have been greatly improved and are kept at a high plane of safety by frequent observations and tests.

Other tests leading to thorough knowledge of the condition of the main units include water-rate costs and observation of the first-stage pressure as compared with the output and back pressure of the unit. First-stage pressures should be checked daily as they have been found to indicate damage to the blading of the machine that is not brought to notice by unusual noise or vibration. Water-rate tests of either elaborate nature or short duration, as merited by the individual case, should be made at least annually if the station is equipped for them. More approximate weekly tests of water-rate conditions can be made to advantage by steam-flow meters if they are installed. These weekly checks need not be continuous, but may be made for several weeks and then dropped for a time. They serve as an indication of the running condition of the unit and show if repairs are needed ahead of the regular inspection.

Most plants place great emphasis on maintenance costs and have some system whereby costs are continually brought to the attention of foremen. This is often not as much a study of economics as it is an effort to save pennies at any cost, and too often it leads foremen to make minimum repairs without sufficient regard to other factors. In some cases this has resulted in increased boiler room maintenance cost as well as increased coal cost due to frequent emergency outages which cause other boilers to be put into service before desired repairs are finished. Boilers are then operated in poor repair and at lowered efficiency. Too short periods in which repairs can be made on a boiler result in hard work under very hot conditions and with a larger crew than is necessary when proper maintenance methods give a better control of outages.

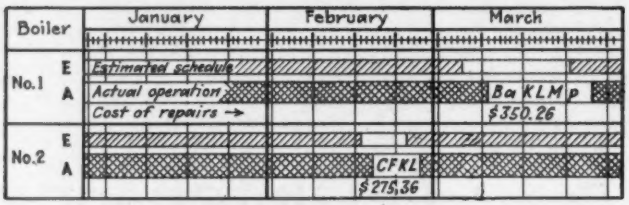


Plotting boiler maintenance expense facilitates cost study

The estimate for the year to come is made after a careful study by the manager and plant superintendent. This study must be combined with a study of boiler schedules and outages so that the sum of fuel and maintenance costs are a minimum.

Proper maintenance economics should, of course, be a study of the balance between coal cost and repair cost leading to minimum total boiler room costs. Control of outages is improved when one man (not necessarily under the boiler room superintendent) is required to fill out an inspection form showing the detailed condition of repairs for each boiler before it is put back in service.

It is often advisable for higher executives with wider experience and broader viewpoint than usually held by boiler room superintendents to work on the problem of boiler maintenance, and a chart similar to that shown here has been of great aid in developing proper main-

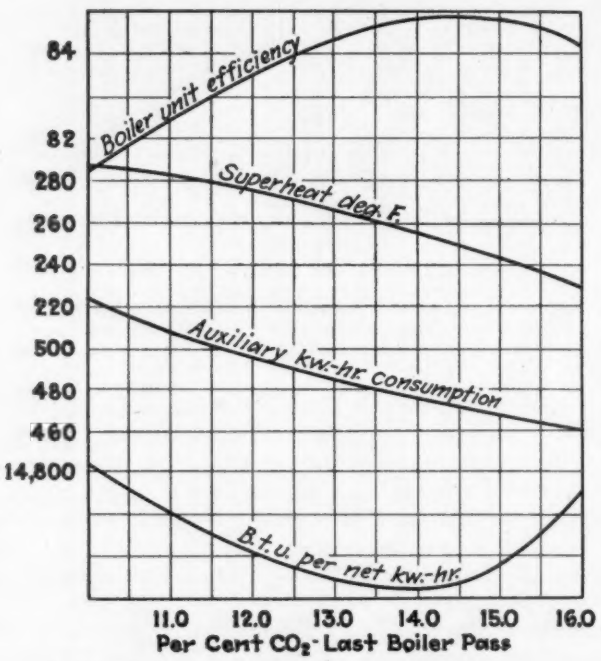


Boiler maintenance chart

The code letters in the spaces for actual operation signify the type of repair work done and the cost figures the total cost of the repairs made. "E" is for estimated, "A" actual costs. In the detail, "B" signifies front wall repairs, "A" arch repairs, "K" soot blower repairs, etc.

tenance methods. Such boiler schedules can seldom be followed rigidly over long periods due to unexpected changes, so that tentative schedules are made out for several months in advance and revised as frequently as necessary. Work done during outages is shown by black code letters and the cause of emergency outages is shown by red code letters. Tentative schedule revisions are placed above the record of actual performance. Cost figures for each outage are also shown to advantage. Such a chart brings to light and to the attention of all concerned many improper conditions and focuses attention on needed improvement in procedure.

There is always a question in the minds of repair men as to the amount of repairs to make, the advantage to be taken of longer use for partially damaged sections and the period of operation to be expected after the boiler is returned to service. Where load conditions require 80 to 90 per cent of the boilers in continuous service and for large units, the repairs should generally be made for a minimum period of three months under good operating conditions. For smaller units (below 1,500 hp.) and for a large number per plant the economical period of operation between outages is often somewhat less than three months, depending on the coal cost, amount of refractory wall surface and other local factors. Many modern plants are planning on much longer periods of operation and such results lead to minimum maintenance crews and maintenance costs.



Effect of boiler excess air on station economy

The lower curve or plant B.t.u. per net kilowatt-hour was determined by tests showing the changes in boiler efficiency, superheat, turbine room heat rate and auxiliary consumption with changes in boiler excess air. A carbon dioxide of 13 to 14 per cent is used, as this results in the best combination of boiler maintenance and plant economy.

Excess air vs. boiler and furnace maintenance

Probably the most important test each plant should run is to determine the effect of excess air for combustion on plant performance. The proper excess air results in the best balance of fuel cost and boiler maintenance costs. Since turbine steam consumption varies with steam temperature, which also varies with excess air, turbine room performance as effected by excess air should also be considered in this test. The effect of excess air on maintenance costs is so difficult to obtain that it is usually necessary to make a scientific guess at this result. The best balance is usually found to be at an excess air considerably above that which results in minimum coal cost or which can be carried continuously, although this depends on local conditions, such as rate of furnace heat liberation, degree of turbulence if pulverized coal is used, or coal burned per square foot of grate surface per hour and ash fusion temperature of coal if stokers are used. Type of furnace construction and type of superheaters are also factors to be considered in this problem. The result of a test conducted for this purpose at the Toronto plant of the Ohio Edison Company is shown here. The curve shows that highest plant efficiency is obtained at 14 per cent CO_2. As this excess air can be carried continuously on the boilers without noticeable effect on boiler maintenance, an excess air only slightly above this point is chosen for daily operation.

In some plants boiler maintenance can be made less dependent on rate of driving by increasing excess air with output, but in other plants this cannot be done either due to limits in draft obtainable or due to poor firing conditions. Where this can be done excess air can be so controlled that the furnace temperature is constant at all outputs and minimum maintenance results. Where it cannot be done the effect of output on maintenance should be estimated as closely as possible and output controlled with this in mind. Water-cooled furnaces should also usually be operated with variable excess air, as the limit of these furnaces is usually indicated by smoke and boiler tube slagging which is obviated by increased excess air at the higher ratings.

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Economies Not Exhausted

Many organizations, particularly industrialists, believe they have exhausted possibilities for economies because they don't realize that they can many times make money by spending it. For example, several iron and steel electrical engineers related, at a recent session of their Pittsburgh convention, that their companies had awakened to the possibility of saving money by spending it. They are doing so by more extensive instrumentation, which helps them analyze operating conditions and costs so they can change operating procedure and save money. Figures of savings were related that ran into tens and hundreds of thousands of dollars in individual cases. Many other industries are less sufficiently equipped.

Strong September Rise in Factory Activity

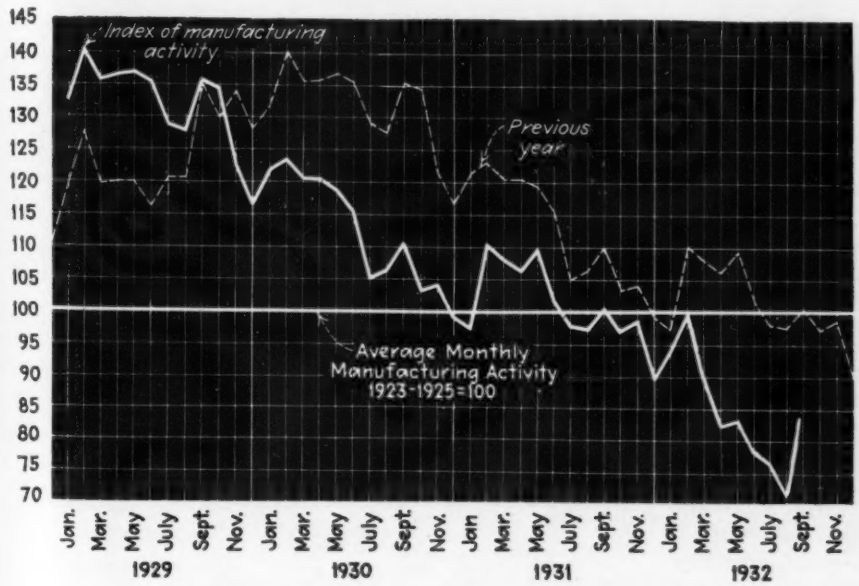
With advances in every industry group the general average of activity in manufacturing for September exceeded that of August by 14 per cent, according to reports of electrical energy consumption received by the ELECTRICAL WORLD from plants throughout the United States. This comparison takes into account the difference of two in the number of working days. However, even without that adjustment the returns in general show a decided increase in energy use.

As is evident from the chart, a moderate advance from August to September is usual. It has been occurring even during these recent years of industrial dislocation. The average advance during the past nine years, however, was only 7.5 per cent. The present rise is nearly twice as great. It restores the April level after the summer sag for the first time in any year since 1929.

For the first time, also, since early spring the gap between this year's and last year's operations for corresponding months was narrowed, although compared with 1931 the current rate of activity is still down 17 per cent. The disparity began in the fall of 1929. It remained wide throughout 1930. In the fall of 1931 it diminished, but the spread widened again after February, 1932, until in August it was nearly 25 per cent. In that respect, then, the September figures reflect a distinct improvement.

The most pronounced gain was in textiles, 29 per cent, or about three times the normal seasonal change. The rise since June exceeds 40 per cent. Leather products registered a further gain, rising 14 per cent higher than a year ago. Rubber partially recovered from the sag in August. The metal industries remain at a low ebb, but the stone, clay and glass group gained vigorously, suggestive of more activity in construction.

Regional changes broadly paralleled those revealed by statistics for the country as a whole. Indices for the South and West will appear in next week's issue.

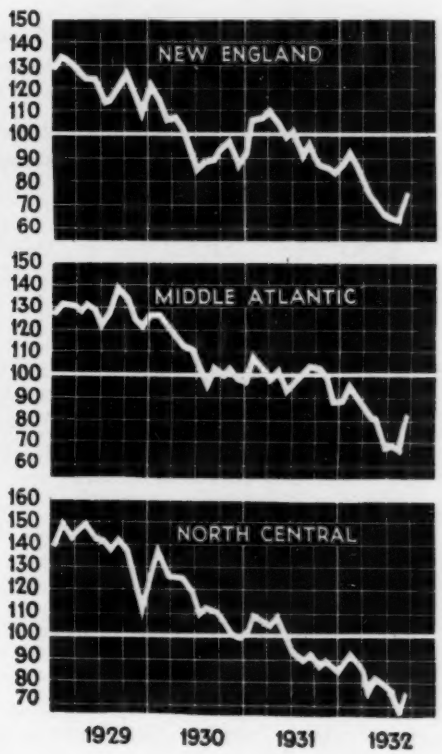


Index of monthly manufacturing activity

Base: Average month 1923-1925 = 100

(Corrected for number of working days, but not for seasonal variation.)

These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries and scattered throughout the country.



Industrial Group	United States Sept., 1932	United States Aug., 1932	United States July, 1932	United States Sept., 1931	New England Sept., 1932	New England Aug., 1932	New England July, 1932	New England Sept., 1931	Middle Atlantic Sept., 1932	Middle Atlantic Aug., 1932	Middle Atlantic July, 1932	Middle Atlantic Sept., 1931	North Central Sept., 1932	North Central Aug., 1932	North Central July, 1932	North Central Sept., 1931
All Industry	**83.4**	**73.4***	**79.2**	**100.4**	**76.5**	**67.7***	**66.2***	**95.6**	**82.8**	**67.5***	**70.0***	**104.0**	**74.3**	**66.8***	**75.4**	**92.6**
Automobile (including parts and accessories)	36.5	33.7*	58.0*	53.8	.....	.....	.....	.....	40.2	36.6	47.5	71.5	36.2	33.6*	57.7	52.0
Chemical products (including oil refining)	126.8	115.8	124.9	144.6	134.0	121.8*	143.4*	178.1	132.1	122.8*	134.2	160.5	106.1	99.0	115.3	121.0
Food products	131.0	123.2*	122.0	142.0	.....	.....	.....	.....	114.9	93.2*	99.7	115.7	131.2	127.0*	124.0	145.4
Iron and steel	50.6	44.0*	51.2*	78.3	91.3	79.8*	85.3	118.0	40.0	33.1*	41.3*	76.3	53.2	47.7*	55.0	76.5
Metal working	49.8	45.0*	50.2	75.0	68.7	54.4	62.3	94.7	48.7	45.7*	50.8	72.2	45.4	39.8*	47.0	68.5
Metals group	50.2	44.7*	50.7*	76.2	75.0	61.7*	68.8	101.4	45.0	40.2*	46.8*	73.9	48.3	42.8*	50.2	71.5
Leather products	93.7	82.2*	73.7	81.9	92.3	85.7*	72.8	73.8	108.2	91.0*	86.0	90.7	76.7	65.5*	59.0	83.0
Forest products	82.8	71.7*	69.2	82.2	42.0	37.1*	37.2	59.8	45.4	52.2*	54.4	72.7	84.7	73.7*	67.7	95.5
Paper and pulp	104.0	93.5*	94.5	138.3	110.5	98.3*	97.7	142.2	68.2	57.8*	61.8	90.2	103.7	92.7*	94.7	*143.2
Rubber products	87.7	76.4*	95.6	88.0	96.8	72.5*	84.8	90.3	.....	.....	.....	.....	83.3	74.8*	95.7	91.0
Shipbuilding	84.0	77.9*	82.5	88.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stone, clay and glass	88.3	71.8*	77.5	113.9	.....	.....	.....	.....	71.8	53.6*	56.7	90.9	101.1	84.0*	96.7	114.8
Textiles	84.5	65.7*	54.0	98.7	64.8	53.8*	39.5	72.7	107.1	73.5*	64.5	127.3	103.5	84.5*	78.3	135.5

*Revision.

Photo-Electric Control of Paper-Cutter Register

By D. R. SHOULTS
Industrial Engineering Department, General Electric Company

The electron tube is likely, in the next ten years, to be applied to a diversity of applications in the industrial and commercial field which no one can visualize now. The applications which will have the most far-reaching effect will most likely be those that substitute for human supervision and control. Radical changes in production methods and possibly machinery may result because of the economies or improved quality of product made possible.

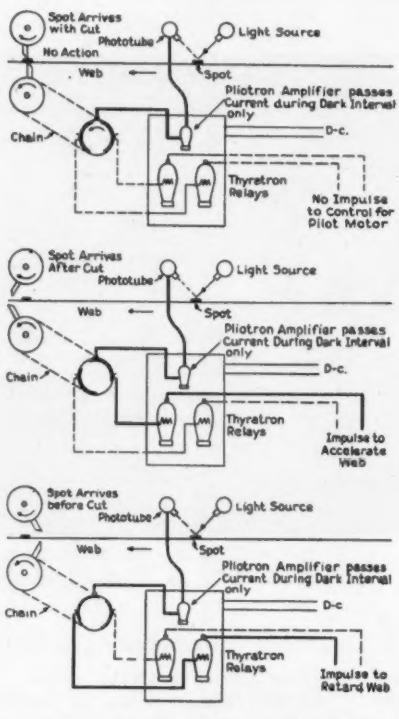
While this article refers to a specific application it illustrates an application which may be found in any industry, namely, holding two or more successive operations in close relationship.

TO MAINTAIN the register of a cutter on a cement-bag-making machine photo-electric control was installed some time ago at the plant of the Jaite (Ohio) Paper Company by the General Electric Company. The equipment is designed to eliminate the necessity of the operator continually observing the cut and making suitable manual corrections. The photo-electric equipment is designed automatically to indicate and make the corrections formerly made by hand and to do this with less spoilage of produce and at a greater speed than is possible with hand observation and control.

To accomplish this automatically, a small register mark is printed on each bag at the point where it is desired to make the cut. As the paper passes through the machine this spot passes underneath an opening in the photo-electric tube housing, causing a variation in the light passing into the tube, thus making it possible to indicate the exact time that the spot passes underneath the tube. The paper passing underneath the photo-electric tube is illuminated by an intense concentrated light beam.

In order properly to time the movement of the spot underneath the photo-electric tube a selector switch is driven from the roll carrying the cutter knife. This selector switch makes an integral number of revolutions with each cut of the knife, and accordingly when the cut is being correctly made the switch will always be in the same angular position when the spot passes underneath the photo-electric tube. If the spot passes underneath the photo-electric tube before or after the selector switch reaches its proper position it is necessary to initiate a correction in the position in which the cut is being made.

This is accomplished by amplifying the impulse received from the photo-electric tube and applying it to the control grid of one or the other of two "Thyratron" tubes. The grids of the thyratron tubes are normally held to a negative potential, but should the light received by the photo-electric cell be reduced by the passing of the spot underneath the opening in the tube housing, a positive potential will be applied to the selector switch, driven by the cutter knife, and this selector switch will in turn, if the cut is not being properly made, impress this positive potential on one or the other of the thyratron grids, depending upon whether the cut is being made ahead or behind the proper point.



How photo-cell mechanism adjusts register

The thyratron selected will then immediately pass current, the time required for this action being considerably less than 1/10,000 of a second and in so doing will energize a relay which will initiate the proper correction in the relationship between the cutter knives and the sheet of paper.

The entire bag-making machine, including the cutter rolls and draw rolls, is driven by an adjustable speed direct-current motor. The gearing between the motor and the machine is arranged so that the main motor is directly geared to the cutter rolls.

The draw rolls are geared to the cutter rolls through a differential gear so that corrections in speed and relative position may be readily made. The main driving motor drives also one side of an adjustable speed drive, which in turn drives one element of a second small differential. The second element of the small differential is normally stationary, but arrangement is provided so that it may be driven by a small adjusting or pilot motor. The output of the small differential is then the summation of two movements, one being the movement through the adjustable speed drive and the second any movement of the pilot adjusting motor. This output shaft then turns the third or correcting element of the large differential to provide the necessary correction of the draw roll.

By the foregoing arrangement it is possible to change

the length of cuts being made by adjusting the setting of the adjustable speed drive and thereby changing the relative speed of the draw rolls with respect to the cutter rolls. It is also possible to make a phase, or space, adjustment between the draw rolls and the cutter rolls by turning the adjusting motor connected to the small differential. Thus, when it is desired to obtain a correction in the cut because the cut is being made early or late, it is only necessary to energize for a short period of time the adjusting motor connected to the small differential. This advances the cut a small fraction of an inch for each correction impulse, and thus serves to bring the cut into the proper position.

In case the setting of the adjustable speed drive is in error, the errors will tend to accumulate and cause almost continuous action of the adjusting motor. To eliminate the necessity for this action there is a second or follow-up correction made on the adjustable speed drive by means of a small pilot motor on this unit. Thus, when a correction is necessary the main adjusting motor advances the sheet a given amount in position and the adjusting motor, on the adjustable speed drive, changes the length of cut being made to a slight extent.

In normal operation a correction will be made very infrequently as the equipment operates before the errors are allowed to accumulate to a large extent.

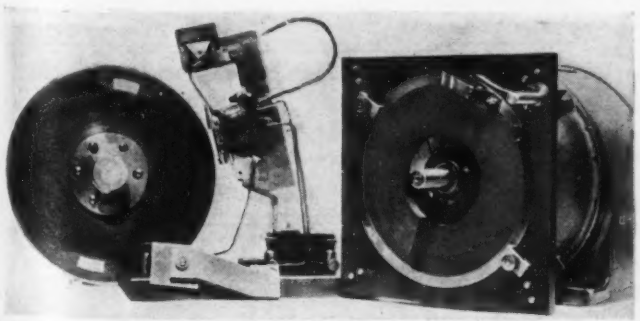
The operating speed of the foregoing machine is a maximum of 600 ft. per minute or a maximum of 300 cuts per minute.

It should be noted that when operating at 600 ft. per minute the time required for $\frac{1}{16}$ in. of paper to pass a given spot is approximately 1/2,000 of a second. To maintain an accuracy or to indicate an error of this amount it is necessary to operate the relay equipment of the panel in that short period of time. Due to the high-speed action of the thyratron operating as a self-locking relay, this is completely possible.

Provision is made so that during threading up of the machine the automatic control may be rendered inoperative and the adjusting motor, operating the small differential, may be controlled by means of a push-button station, mounted conveniently, by the operator. Thus the operator may bring the spot in approximately the correct relation with respect to the cutter before starting the machine. He then energizes the automatic control by a convenient push button and this control refines the adjustment and maintains it during the remainder of the run.

This equipment has been operating in regular production service for several months and requires but a minimum of attention and maintenance. This is due to the fact that the tubes, and also the remainder of the control equipment, have been designed with a particular reference to industrial service where reliability and long life are essential.

It is anticipated that there is a wide potential field for equipments of this nature on all sorts of converting machines and presses where it is required to hold two or more successive operations in close relationship.



Synchronous contactor and high-speed switch disassembled

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Contactor Closes Circuit at Selected Point on Wave Form

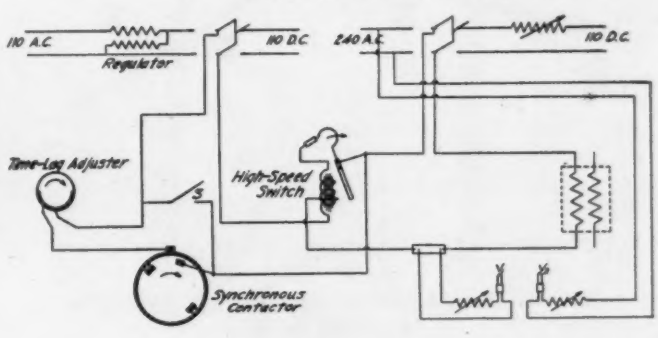
By H. R. REED

Michigan College of Mining and Technology, Houghton, Mich.

Transient phenomena in alternating-current circuits are influenced in magnitude and other characteristics by the time of their initiation; that is, if they start at one point on the voltage wave their characteristics may be very different from what would appear if the start had been at another point. For laboratory study of these differences the author has developed certain devices to be used in conjunction with an oscillograph and by means of which transients may be initiated at any point on the wave and oscillogram records made of them.

These devices, shown schematically on the drawing, are a synchronous contactor, a high-speed switch and a time-lag adjuster. The contactor is mounted on the shaft of a synchronous motor and is arranged to make one contact per cycle. The two contacts shown on the drawing indicate that a four-pole motor is used in this particular case. A two-pole motor would require only one. The brush that wipes the contactor segments is adjustable through a complete circle so that the brush position determines the point on the wave form at which the contact is made. The solenoid of the high-speed switch is in series with the contactor so that closure of the switch occurs when the contact segment moves under the brush. In order that the insulating material in which the contact segments are imbedded may not be damaged by the arcs from inductive discharges caused by continuous opening and closing of the solenoid circuit, this circuit is opened by a breaker having a magnetic blow-out which is incorporated in the high-speed switch. The core and armature of the switch are made of hard steel

Scheme for oscillographic study of transients



whose residual magnetism holds the switch closed on the test circuit and open on the solenoid exciting circuit until the switch is demagnetized by closing the switch *S* and passing a diminishing alternating current through the solenoid.

It is obvious that if the synchronous motor is stopped and restarted the setting of the contactor may or may not be found to be 180 deg. away from its former position, depending on the field position of the motor when it locks into synchronism.

The third device, the time-lag adjuster, compensates for the elapsed time interval between the instant of energizing the oscillograph shutter circuit and the actual opening of the shutter. This time lag is not a factor in the study of continuous or comparatively long-time phenomena, but it became a factor because the speed of initiation of the transient by the synchronous contactor and the high-speed switch was so great that the transient had passed into history before the film was exposed. The adjuster consists of a semi-circular contact fixed on the film drive which operates the shutter. Pulling the trigger on the oscillograph sets the film in motion and the shutter is open by the time contact is established on the time-lag adjuster. The next closure of the synchronous contactor finds the high-speed switch exciting circuit energized and the transient occurs with the film exposed. The complete operation from the pulling of the oscillograph trigger to the start of the transient is a matter of only a few hundredths of a second.

▼

"K"-Frame Line Has Many Advantages

By C. A. BOOKER
Transmission Line Engineer
New England Power Engineering & Service Corporation

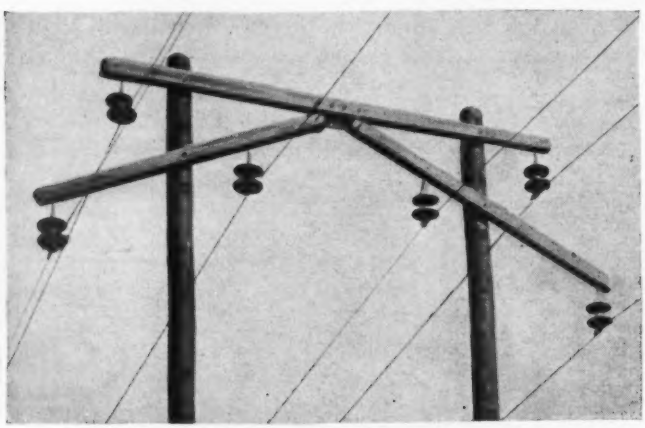
A new type of double circuit 22-kv. line embodying several flexible construction features will shortly be completed by the New England Power Engineering & Service Corporation for the Southern Berkshire & Electric Company. This line extends from Lee to Great Barrington, Mass., a distance of about 13 miles, and will replace older circuits now operating between the same termini at 11 kv. The location follows in general the valley of the Housatonic River through the Berkshire hills, a territory which is subject to severe electrical storms because of the broken terrain.

A type of two-pole structure was sought which could economically use disk insulators for this voltage as well as take advantage of the insulating properties of the wood poles and crossarms. This quest resulted in the development of a structure which, from the shape of the crossarm, has been called a "K" frame and which has proved to be slightly less expensive than the familiar double-circuit pin-type line having single poles and 150 ft. spacing.

The design calls for pressure-treated Southern pine poles and crossarms, two-disk insulation, No. 1/0 A.W.G. copper conductors and average spans of 330 ft. The twin poles are set on 10 ft. centers and the crossarm is so fabricated that the brace serves to support two conductors in addition to providing an effective portal to keep the structure plumb. The inside wires of the two circuits are 6 ft. apart and the wires of each circuit are so arranged that the testing and replacement of insulators, together with other maintenance, can be readily accomplished.

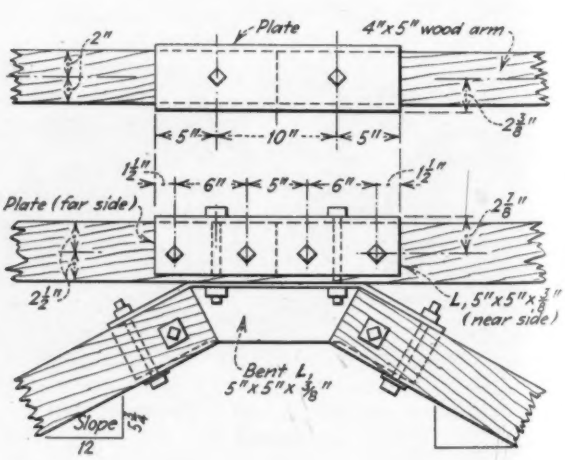
The center connection for the crossarm is formed from an angle and plate, together with a second angle bent at both ends to receive the two braces, and is so arranged that wood members can be replaced separately. When pole replacements are necessary the center can be disconnected and the circuits treated individually. Dead-ends are made by double-arming with suitable channel spacers. Erection struts for tying the end of the horizontal crossarm member to the end of the brace member are removed after the assembled arm is raised and bolted to the poles.

No overhead ground wire is provided in the initial construction, but the structures are arranged so that one can be added either above or below the circuit and on either or both poles if operating experience indicates its desirability. Wood strain insulators are used in guys to take advantage of the insulation on the wood pole itself. All angles are taken on vertical corner construction, a suitable bracket being used to hold the wire away from the pole when the angle is so small that the transverse load does not accomplish this result.



Construction permits use of long spans and circuit segregation

Detail of middle joint in crossarm



Retaining Existing Customers

For sixteen years Mr. Taylor has sold power to industries in many parts of the country. For ten years his average sales exceeded $100,000 per year in new power business, most of which was in private plants shut down. This total was made up of both large and small contracts, ranging from the small cheese factories of Wisconsin to the phosphate and iron mines of the South and East.

In addition to his personal selling, Mr. Taylor has supervised industrial power and lighting sales departments and has had considerable experience in the design and application of rates. He has at all times worked in direct contact with the managements of his companies and knows the attitude of management toward the problems of the power sales department. As a result of this experience, he has been able to offer in the series† of which this is the first installment several suggestions to the power salesman who wants to learn how to get along inside the company as well as outside.

While the ideas presented in this series are necessarily expressed in terms of the writer's experience, he makes no claim of originality for all of them. For more than a year Mr. Taylor wrote for the "Electrical World," traveling through many states, interviewing leading commercial executives of utilities and manufacturers. From these interviews he was able to gather much that was new and important to every commercial man. Some of these ideas, seasoned by application in his own experience, are here set forth as being worthy of serious consideration by progressive power sales managers.

By DEAN TAYLOR*
Utility Management Corporation

RETENTION of existing power business, while depending somewhat upon the general state of the company's public relations, depends far more on the power salesman's specific knowledge of the customer's actual conditions and actual needs. It is more important for the power salesman to know how the customer is using the service and what he could probably do by way of generating his own power than it is for the salesman to spend much time in the manager's office explaining the growth and strength of the utility industry and expanding upon its importance in the community. In securing new business it is important to begin at the top, but in retaining existing business it is important to begin at the bottom, where the service is actually being used and where friction with the power company is most likely to make itself first known. Slight irritations or misunderstandings arising in the customer's shop may grow to enormous problems in public relations by the time they have reached the customer's front office.

The first step in retaining existing business is to assist the customer in making the largest and most satisfactory use of the power company's service and in addition lending any help possible in reducing the costs of other facilities such as steam and water, so as to give the customer the lowest over-all costs for light, heat and power. The summary of an investigation aimed at reducing a customer's present costs for power and steam will be presented later in this series, which is an example of what can frequently be accomplished.

Boiler Room—Perhaps the best place to start in helping a customer reduce his present costs for steam and power is in the boiler plant. Many of the boiler plants now in operation were installed more than ten years ago, and it is to be expected that even with intelligent maintenance these boilers are now operating at efficiencies that would be considered low when compared with really modern boilers. Also the labor required to operate the old boilers is frequently greater than for modern boilers with the same output. The higher efficiency of modern boilers is due not so much to their being new as it is to the great amount of thought that has been given to their design and the relation of the boiler room auxiliaries to the boiler itself. Quite frequently an old boiler plant can be modernized without scrapping the old boiler. At the same time a change in fuel will frequently result in higher efficiency and lower maintenance and labor costs. The present tendency toward replacing low B.t.u. coal with high B.t.u. fuel oil is one that is likely to continue. Some of the reports on recent changes from coal to oil in industrial plants indicate an annual gross return of more than 100 per cent on the investment.

When it is remembered that the cost for steam in some industrial plants is a great deal more than the cost for electric power and when possibilities have been demonstrated for returns of from 50 to 100 per cent on the investment from improvements in the boiler plant it will be seen why it is worth the power companies' time and effort to assist their present customers in reducing their steam costs. The opportunities for savings by the customer in this direction are far greater than any fancied saving from substituting generating units for purchased power.

The accompanying report illustrates what can be done in the boiler room with low-cost fuel oil.

Steam Utilization—Another fruitful field for possible improvement in the customer's factory is in the use of steam for building heating. It is unusual today for factories to be constructed without making at least some use

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†*See subjects in this series on page 567.*

of the "unit heater." This truly modern development in heating, using steam, gas or electricity for heat in connection with a motor-driven fan, can find many profitable applications in old mills, particularly where the present heating installation is inadequate or where heating is required only intermittently, resulting in large standby losses in a direct radiation system. It is quite often found more economical to use small high-pressure

$56,000 Oil Burner Investment Pays 109 Per Cent*

Silk Dyeing Mill Finds Fuel and Labor Savings Exceed Burner Installation Cost

By J. G. BERGER, M. E.
Consulting Engineer, Newark, N. J.

Early in 1930 the Lyons Piece Dye Works, Paterson, N. J., decided, due to business conditions, to reduce production costs. After a careful study of those departments in which savings might be effected, the boiler room was selected, for the cost of steam production in such a factory is a large part of total manufacturing costs. The Lyons plant dyes prints and finishes pure silks and tin-weighted materials, including French velvets, crêpes, chiffons, shantungs. It maintains an extensive boiler room comprising eight 200-hp. and six 300-hp. boilers of the horizontal return tubular type.

Before any changes could be made in the boiler room, the fuel to be used had to be selected. Because of favorable prices, together with possibilities of labor saving and operating cleanliness, fuel oil was chosen. As these boilers could be satisfactorily fired with oil if the combustion chambers were redesigned, high-pressure, industrial, mechanical atomizing burners manufactured by the Petroleum Heat & Power Company, Stamford, Conn., were installed.

In changing over to oil burning, it was, of course, necessary to install oil pumps, oil heaters, burners, burner piping, starting equipment in case of complete shut-down, regulating valves and controls. Two concrete tanks with a combined capacity of 100,000 gal. were constructed. These had to be properly water- and oil-proofed. New furnace linings and red brickwork had to be supplied in the boilers. Other changes to the boilers included installation of new feed lines and hanging of the small boilers on gallows frames, as they were formerly flat-lug set. The entire cost of this work and equipment amounted to $56,006.37, including the concrete tanks, which were about 18 per cent of the total cost. Due to terms of payment arranged by both the burner company and the builder of the tanks, savings from oil burning practically carried the payments made on the job. The six 300-hp. and four of the 200-hp. boilers were changed over to oil firing.

In 1929, the last complete year of coal operation, the quantities and costs, according to the factory's records, were as follows:

Total yearly coal consumption, tons	43,275
Cost of anthracite coal, per ton delivered	$4.45
Cost of bituminous coal, per ton delivered	$6.00
Cost of nine parts of anthracite rice coal and one part slack bituminous coal, per ton (2,000 lb.)	$4.60
Boiler room expenses	8,374.54
Boiler room labor	47,041.25

The last item, boiler room labor, included, among other things, eighteen men at $2,100 each per year. The necessary firemen, coal passers, ash handlers and such maintenance men as were required both before and after the change-over constituted this force.

Before abandoning coal firing, an A.S.M.E. code test was conducted on two of the 300-hp. units which were later oil-fired. The test was conducted by the writer's staff with the assistance of the oil burner contractor's office. This coal-fired test therefore gave exact conditions of operation and served as an accurate guide with which to judge oil-fired operation.

Efficiency of boiler, furnace and grate, per cent	64.07
Cost of coal per ton of 2,000 lb. delivered, per cent	4.60
Cost of coal required to evaporate 1,000 lb. of water under observed conditions, cents	26.4855

Since these boilers were the larger of the two sizes, were fired with more care than would ordinarily be the case, and since higher peaks might at times be carried by some of the boilers, it is fair to assume that the average plant efficiency, taking banking into account, would be 5 to 7 points lower, based on experience in other plants, or about 58 per cent. For later comparison with oil, it was assumed: Coal cost was equivalent to 30 cents per 1,000 lb. of steam.

As soon as these boilers were in operation on oil for a reasonable period an A.S.M.E. test was conducted with oil firing to determine the actual fuel saving and whether or not the guarantees had been met. Steady operating conditions at several loads over a reasonable range indicated that all guarantees had been met. Average "as fired" efficiency with oil burners—boiler and furnace—79.6 per cent. Since the setting of a boiler absorbs or gives off heat during rising or falling loads, the momentary efficiency is erroneous when no allowance is made for this heat transfer. In order to make a comparison with the coal-fired tests, the entire period from 8:30 a.m. to 8:30 p.m. was used as a basis for comparison, and the efficiency corrected as follows:

Per cent of load	178
Efficiency obtained, per cent	79.6
Allowance for test conditions 3 per cent giving a net operating efficiency of, per cent	76.6

Based on a cost of 3 cents per U. S. gallon for No. 6, or bunker C, fuel oil, the cost of fuel for 1,000 lb. of steam is calculated as 26.82 cents fuel cost per 1,000 lb. of steam.

Hence for every 1,000 gal. of fuel oil burned, in addition to labor saving, this plant saves the following in fuel cost (allow three-quarters of 1 per cent of the steam chargeable to oil heating, but make no allowance for oil pumped because coal and ash conveying is eliminated and will balance same approximately):

$$0.30 - \frac{0.2682}{0.9925} \times \frac{1{,}000 \times 8.0215 \times 13.94}{1{,}000} =$$

$3.33 saved for every 1,000 gal. of oil burned during the first two years.

Although the original estimate was based on oil at 3 cents per gallon, the average cost to September 30, 1931, was as low as 2.66 cents, so that the actual saving for the entire period has been computed as $6.74 per 1,000 gal. of oil burned, instead of $3.33 as figured during the test. Following is a summary of total investment and savings:

Investment

Cost of oil-burning installation and concrete oil tanks	$56,006.37

Savings

(As of September 30, 1931)

$\frac{3{,}811{,}904 \text{ gal.}}{1{,}000} \times \$6.73$	$25,654.65
Labor saved to March 31, 1931	2,800.00
April and May, saved eleven men	3,850.00
June, saved 12 men	2,100.00
July and August, saved 14 men	4,900.00
September, saved 14½ men (two men on part time)	2,537.50
Total saved to September 30, 1931	$41,842.15
Total savings for twelve months ending December 31, 1931	61,500.00

Based on the September, 1931, price of oil and with normal business that existed up to that period the savings for one year or up to December 1, 1931, were estimated to be $61,500, or 109 per cent gross return on the investment.

In addition to the excellent savings the oil burner installation has effected, I was informed by Dr. E. Cadgene, president Lyons Piece Dye Works, that manufacturing operations had been bettered by the fact that small cinder particles are now eliminated from the air in and surrounding the plant.

Reprinted in abridged form from "Fuel Oil Journal," April, 1932.

lines to supply unit heaters than it is to use the larger low-pressure lines. This improvement of the heating system is an item in reducing the potential requirements for exhaust steam and for generating units to provide this exhaust steam.

Still another direction in which economies may be sought is the proper return of condensate from the processes and heating system. This is particularly important if the boiler plant is being improved to take advantage of high rates of evaporation where maintenance of high quality of the feedwater is necessary, making the availability of pure condensate an important item. The elevation of the feedwater heater to create pressure on the suction of the boiler feed pump will raise the temperature of the feedwater and the efficiency of the boiler room. The increasing use of deaërating heaters for prevention of corrosion in high rating boilers has focused attention on the desirability of recovering and properly handling the maximum amount of condensate that can be recovered economically. What experience the power salesman may lack in discovering these opportunities for savings in the production and utilization of steam should be supplied by the company's power station or testing personnel.

Subjects Which Will Be Covered by This Series

Retaining Existing Customers.
Sifting Power Prospects.
Meeting Diesel Competition.
Where to Begin Sales Approach.
Process Steam — an Opportunity.
Making Power Reports Effective.
Payment-Out-of Savings Engine Contracts.
When the Odds Are Against You.
Yardsticks for Power Sales.
Power Sales Management.

Power-Factor Improvement—Turning to the application of electric power in the customer's plant, there are several directions in which improvements may be sought. The first of these is the old one of reducing losses and improving power factor by running load tests on all motors and replacing underloaded motors with motors of the proper size and characteristics. Such an investigation generally includes an analysis of the possibilities of using static or synchronous condenser equipment to raise the power factor to a point where a penalty can be avoided or a credit earned. Quite often there are other advantages in improving the power factor and the proper loading of motors, such as reduction in voltage drop, improved lighting conditions, and improved speed regulation of motors, which may justify such attention even if there is no power factor penalty clause. From the standpoint of the power salesman, a credit for power factor gives the customer a lower average rate to be compared with what can be done with a private plant. Too many plants have been installed where the capacity of the generator was soon found inadequate because of the low power factor of the customer's load. It is better to make the improvement that will save the customer money and give the power company credit for offering the lowest possible rate.

Lighting Improvement—A survey of the customer s lighting is one of the obvious things that should be undertaken. Trial installations of improved lighting can be made a part of a general plan to increase the customer's good will and are always appreciated if undue sales pressure is avoided. A well-planned and strategically located trial installation of industrial lighting will generally sell itself.

Capitalizing Complaints—During periods of low factory production complaints of customers are frequent, particularly if their power usage falls below the minimum bill. It is sometimes possible to convert these complaints into new business. A customer who is using substantially less power than is covered by his minimum bill is in a position to benefit from a new application which will build up his power load to the minimum bill. If the cost of making the new application is not too great it may actually be easier to sell this additional load during hard times than during good times. Electric space heating is one type of new application that may be sold to a minimum bill customer; air conditioning is another. Still other applications will suggest themselves to the wide-awake power salesman who is not afraid to consider a complaint as an opportunity.

Ownership of Substation—A factor that has been of assistance in many situations where a customer may have considered installing his own generating plant has been his ownership of his substation. Not infrequently the ownership of a substation by a customer has kept him from installing his own plant because he has realized that he could not easily sell his substation and the fixed charges on it would have to continue in addition to the new fixed charges on the generating plant. Customer ownership of a substation generally makes possible a lower average rate, and this, together with the difficulty of disposing of the substation, makes continued purchase of power more desirable. For these reasons, power companies may well encourage customers to purchase and maintain their own substations, even to the extent of enabling them to purchase the equipment over extended periods of time. The practice of transformer rental would appear to be less desirable than outright ownership as the monthly rental charges are likely to prove irritating to the customer as a direct charge against purchased power.

Building Up the Customer—There are advantages to building up a customer's load other than the immediate increase in revenue. One of the best deterrents to a customer contemplating a private plant is his proper concern as to whether the generating units selected will prove adequate in the future. If the power salesman has been aggressive in building up the customer's load over a period of time he may properly point to this increase as being something to reckon with in the future if a plant is ever considered. A customer whose load has increased rapidly or steadily will have to consider a larger plant than one whose load has shown little change over a long period of years. For this reason customers should be encouraged and helped in adding to their loads as rapidly as their needs permit, and means of financing may often be justified by the benefits to both the customer and the company. Electric furnaces offer great possibilities in many cases. Space heating, electric steam boilers and improved lighting are ways to build up a load to the point where a contemplated generating plant would have to be much larger than where the load was permitted to grow without any cultivation.

Improved Rates—Considering rates, there are a number of things that can sometimes be accomplished which

will make the continuance of purchased power more attractive and the possibilities of generated power less attractive. One of these is the introduction of rates having lower energy charges and higher minimum charges. Another is the use of a rate having a comparatively high demand charge with lower bottom steps on the energy charge. Customers who ask for lower rates can sometimes be satisfied with a rate which is low if used heavily but which, because of its high minimum charge, protects the power company's revenue in the event the customer's forecast of his usage is too optimistic. Estimates of savings with generated power are frequently based upon running the equipment at high average loads and the customer frequently overlooks the possibility of having to pay very high fixed charges per kilowatt-hour in the event his production drops to a low figure.

A recent tendency in rates to meet the demands of customers who claim a very low operating cost for generated power has been toward a form of two-part rate that is essentially a high load factor rate and in which the minimum charge is based upon a substantal number of hours' use of the maximum demand, corresponding to load factors as high as 40 and 50 per cent. Such rates can have very low bottom steps in the energy charge without any loss in revenue because it will be necessary to pay the demand charge plus the higher blocks of the energy charge before any of this low-priced energy is available.

For example, if the present rate should be $1.50 per kilowatt of demand plus energy charges starting at 2 cents per kilowatt-hour and graduated down to 1.5 cents per kilowatt-hour, an optional rate could be substituted having a demand charge of $2 per kilowatt and energy charges starting at 1.5 cents per kilowatt-hour and graduated down to 0.75 cent per kilowatt-hour. In the latter case the customer considering generating part of his load would save only part of his demand charge plus energy at only 0.75 cent per kilowatt-hour instead of energy at 1.5 cents per kilowatt-hour or higher, making the generation of part of his load less attractive. The extreme case would be a still higher demand charge and little or no energy charge.

The advantages of high minimum charges are quite obvious when we consider service for standby purposes only. Some power companies have such low standby charges that the customer can afford to generate his entire requirements for a good part of the year, such as the heating season, and fall back on the central station for part or all of his requirements for the warm months. This is manifestly unfair to the power company and its other customers. The power industry and its rates have been built on the sound policy of charging on an annual basis because of the tremendous investment charges which must be met—charges several times larger per dollar of revenue than in almost any other business. Customers who can, but do not, take power throughout the year are taking advantage of the company and its other customers. The introduction of high minimum or standby charges would induce the customer to use more central-station power during the months when he would otherwise be tempted to generate his own requirements.

In not a few power company territories conditions will be found where it is practically impossible for the power company to obtain the entire load of many of the largest customers because these customers are already purchasing a part of their requirements, while the power company is providing standby service for their entire requirements and at extremely small standby charges. To avoid such conditions, or to correct them where possible, lower energy rates with higher minimums and higher demand charges would bring in more revenue with practically the same over-all cost to the power customer.

Too many power salesmen and some companies are satisfied with half a loaf where they might just as well have the whole to the advantage of every one concerned.

There are many ideas other than those indicated above which can be used by the alert power salesman to combat the growing tendency of his power customers to consider the generation of part or all of their requirements. Experience has demonstrated that it is more profitable to follow up some of these ideas for reducing the customer's present cost than it is to spend too much time "cultivating" him by social calls at the office, on the golf course or at the club. The hazard of depending on one's personal influence with a customer grows out of the tendency of a customer who is being "cultivated" to dissociate the salesman's personality from the company for whose service he may grudgingly issue his monthly check. All too frequently a power salesman is told by his customer or prospect: "I like you personally, but I don't like your company." Power companies are not primarily social organizations and their first responsibility is rendering the best possible service to the customer's plant rather than providing agreeable social companions for the officials of the customer's organization.

A parting thought in connection with this whole matter of retaining existing customers:

If the power salesman will treat his existing customers with the same consideration that he does a prospect, giving them the benefit of his own experience and that of the power company's organization, he will have less and less occasion to transfer the name of a customer from his list of users to his list of prospects.

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Rural Service Costs

In the article Analysis of Rural Line Costs (October 8, page 507) there appeared a table (I) in which the cost of services and installation per mile for district No. 7 was considerably below the average or any other minimum figure for this item. Investigation reveals the following explanation:

"At the time all service costs were included in the authorizations for specific line extensions; then the practice was changed and service costs were omitted from specific authorizations and charged to a general blanket appropriation. In this particular case services were estimated at material, $4.90; labor, $3.55; total, $8.45. But due to certain irregularities in the charges between construction forces and the accounting department apparently only a few of the services were charged to the specific authorizations, the majority being charged to the blanket. The figures which we submitted were based

on actual charges to the specific authorizations. Therefore the service cost figures are entirely out of line, being very much too low.

"Such a condition does not exist in our more recent figures. Services are now charged to the blanket appropriations and in every case we assume that the actual service cost is equal to the estimate."

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Substation Has "Reversed" Ventilation

By OSCAR J. ROTTY
Superintendent of Substations
Union Electric Light & Power Company, St. Louis, Mo.

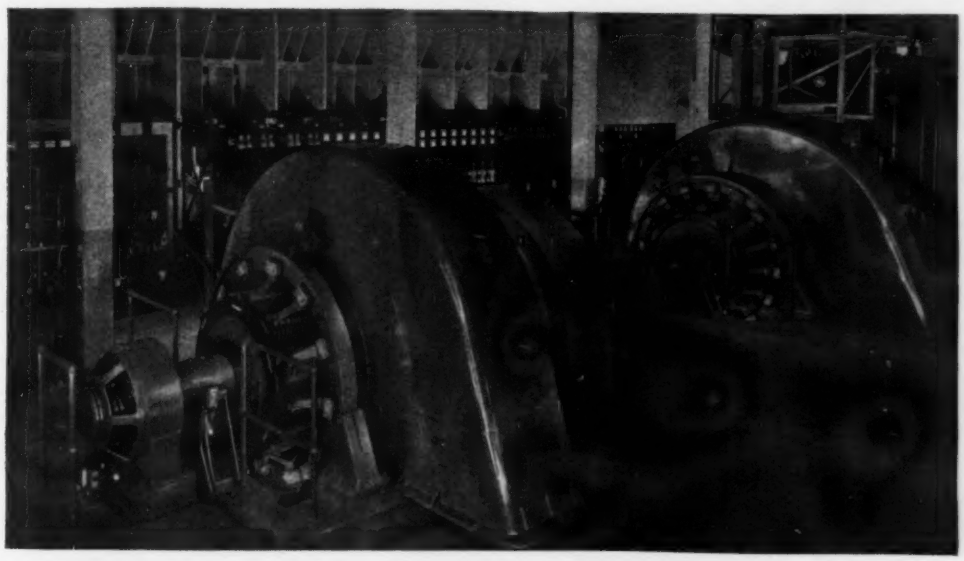
Complete elimination of unsightly and bothersome air ducts is accomplished in the new Fifteenth Street substation of the Union Electric Light & Power Company by the use of a "reversed" system of ventilation. The air moves opposite to natural circulation, the heated air being drawn down into the basement and the intake entering the main room above. This has the advantage of cooling the main room in summer, which adds greatly to the comfort and efficiency of men in the station.

The air intakes are provided with doors which may be partly closed in winter for reducing the amount of cold air drawn into the station and damper doors in the discharge stack may be opened to permit recirculating some of the heated air. Air is drawn into the station through louvers in the front of the building and then passes through air filters into the main machine room. The intake louvers do not mar the building architecture since they are concealed behind ornamental iron grilles and are generously designed so as to not introduce much additional air resistance. The filters are of the continuous self-cleaning type and are automatically operated by a time switch. The station windows are permanently sealed shut and all doors are weather-stripped so as to prevent the infiltration of air and dirt.

The machines take the air from the main floor and discharge it into the basement, from where it passes through blowers and is discharged through a built-in brick stack in one corner of the building and leading up through the roof. The frames of the generator and converter are inclosed in volute housings or scroll cases which collect the heated air and direct it into the machine pits. These housings are somewhat wider than the machine frames so as to pull in the hot air from the commutator riser bars and the armature end turns in addition to collecting all the air from the armature and field coils. Air is drawn into the machines through the armature spider and across and under the commutator. The synchronous motor is provided with the conventional inclosing shell and takes in air on each side along the shaft and discharges it into the machine pit.

In general, the converter transformer is self-ventilating and probably preheats the air of the main floor slightly. However, floor gratings directly beneath the transformer radiators permit of air being drawn over the radiators and into the basement by the suction of the station discharge blowers.

For each machine an automatically controlled, motor-operated, sliding steel door closes to shut off the machine pit when the unit shuts down. This is to stop the supply of air to the machine in case of a fire and also to prevent wasting air with the unit out of service. This door again opens automatically when the machine is restarted. The discharge blowers also operate automatically. The first or "preferred" blower starts when either machine starts and runs as long as a machine is running, while the second is started on temperature of the machine discharge air as detected by a thermostat located in the discharge air section of the basement. A throwover switch permits making either blower "preferred," the other one operating on "temperature."



Volute machine housings aid ventilation

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Proposes Scientific Study of Economic Problems

The government of Great Britain (or of U.S.A.) should establish an experimental self-supporting colony, under the control of engineers, scientists, and economists, to ascertain how far it is possible with present-day knowledge, and with the best methods of manufacture and distribution, for a group of say, 100,000 (unemployed) persons to maintain themselves and to increase their wealth, when freed from the restraints and errors of our modern civilization. This is a proposal of Miles Walker, president of the British Society for the Advancement of Science. Such an experiment Professor Walker considers would do much more to enlighten the world than that now being carried out under Soviet control in Russia.

International Comparisons Show Slight Error in Electrical Units

MOST people credit electrical measurements with the highest of precision and correspondingly look upon the primary electrical units as nearly the acme of preciseness. Actually, however, the history of the standards which were intended to represent these units has revealed discrepancies of a few hundredths of 1 per cent among the volt, ampere, ohm and watt used by national standardizing laboratories and the fundamental units which they were intended to represent. The watt is perhaps the unit of greatest importance to the electrical industry in general. Smaller discrepancies exist between the international units maintained in the various national laboratories. Recently extensive intercomparisons have been made between the government laboratories in this country, Germany, France and England. These laboratories are the U. S. Bureau of Standards (BS), Physikalisch-Technische Reichsanstalt (PTR), Laboratoire Central d'Electricité (LCE) and National Physical Laboratory (NPL) near London.

Only a few parts in a million change was found to have taken place in the American wire resistors and standard cells when these were returned after being carefully carried to the other laboratories for comparison. Two of the Reichsanstalt's standard cells were also brought back to Washington for additional corroborative data. This work repeats in general that done by the International Technical Committee in Washington in 1910 in carrying out the mandates of the International Conference on Electrical Units and Standards in London in 1908. At that time the ohm was set up as the mean value of the German and British mercury units. It was on the basis of this establishment and of the coulometer results on current deposition that the electromotive force of the Weston normal cell at 20 deg. C. was set as 1.018300 volts.

Mercury ohm little used

Since that period recourse to the mercury ohm and silver coulometer has been infrequent, the laboratories largely maintaining their units through wire resistance coils and carefully maintained standard cells. It has become tacitly recognized that the units the volt and ohm can be maintained to a higher degree of constancy by these standards than by frequent reversion to the mercury column and silver coulometer.

But in the intervening 21 years it has become more and more evident that significant differences had crept in, somewhat more among the American, French and German units than between the American and British. Apparently the wire standards drift slightly in time, amounting to an increase of about 1 microhm per year in the one-ohm replicas.

Similar comparisons of the volt standards have also been made with the European laboratories by George W. Vinal of the bureau staff. These checks show a high degree of consistency. Silver coulometer measurements took much time and great care because of the chemical purification of the cells and solutions and the delicate weighing of the deposits. There was somewhat more spread in numerical results than in the case of the ohm and volt-cell measurements, but a conference of the experts at Berlin agreed that the results confirm the 1.0183-volt value of the Weston cell as adopted in 1910 and that the PTR volt used until these comparisons was low by about 1 part in 10,000. The German volt has since been revised.

All these results are summarized on the chart, which shows the extent to which the units the ohm and the volt, as well as the derived units ampere and watt, differ in the calibrations and certifications made in the respective countries. For the watt the spread between the extremes is approximately 0.02 per cent, with lesser deviations for the ampere, volt and ohm.

Preparations for absolute ampere and ohm

The broad program contemplates parallel determinations at the national laboratories of the absolute ampere and the absolute ohm and the evaluation of the absolute volt from these two fundamentals. At the Bureau of Standards the absolute ampere is being related to the international ampere by means of the Rayleigh balance, in which the force of attraction (about 10 grams) of two large fixed coils for a smaller moving coil weighing 1,500 grams is weighed. Special refinements are necessary to avoid error from convection currents of air from the heated moving coil, and to measure with the desired precision (one part in a million) the force of 10 grams in conjunction with the dead load of 1,500 grams. The ratio of the radii of the fixed coils and the moving coil is measured with high accuracy by separate experiments. This ratio is used in computing the absolute current from the measured force between the coils.

The relation between the absolute ohm and the international ohm is being determined at the bureau by the construction of single-layer solenoids, the highly accurate mechanical measurement of their dimensions, and the measurement of their inductance in terms of the international ohm and the unit of time. This value of inductance is compared with the inductance in absolute henries as computed from the mechanical dimensions of the solenoid. The bureau's results thus far indicate that the international ohm is equal to approximately 1.0005 absolute ohms. A similar method has been used at the German national laboratory. The British laboratory has used the Lorenz apparatus, a sort of precisely measurable homopolar generator. Japan also is at work on the problem.

In spite of the great difficulties with absolute measurements there is a growing feeling that the precision with

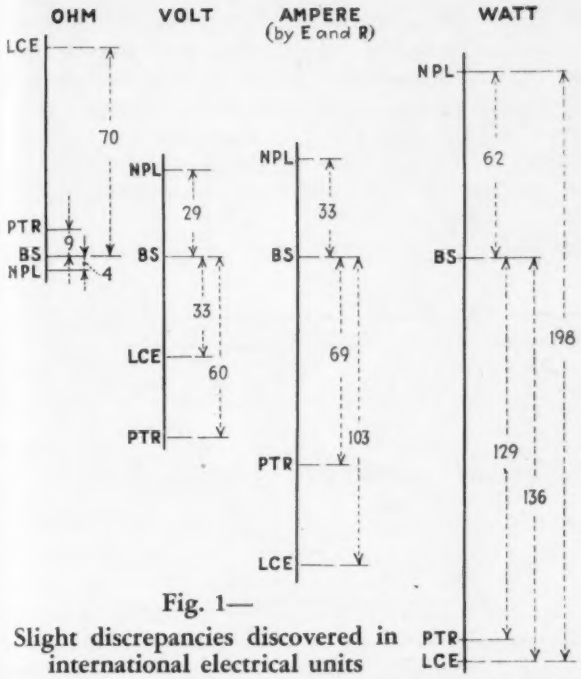


Fig. 1—
Slight discrepancies discovered in international electrical units

Parts in a million difference in the standards maintained by the British (NPL), German (PTR), French (LCE) and United States (BS) national laboratories as found by recent intercomparisons, for which Dr. Vinal was sent abroad.

which absolute measurements can now be made will shortly make possible an international agreement on values for the units established by absolute measurements and justify congressional action toward expressing the legal volt, ohm and ampere in terms of the absolute units rather than the international physical standards now in force.

High-voltage electrometer developed

Meanwhile, there has also been developed by H. B. Brooks at the bureau a high-voltage electrometer of the absolute type, not, however, intended to be the basis for an absolute standardization of the volt. Its principal virtue lies in the direct application to the instrument of the whole voltage to be measured, thus eliminating the transformer or voltage-divider accessories otherwise in vogue for high-voltage measurement. It will be valuable in redetermining the calibration of the sphere gap and in calibrating high-voltage transformer ratios. The various formulas for the sphere gap are not in consonance and it is believed that these can be reconciled or revised by an analysis based on results obtained with the new electrometer, which is now ready for service. Work on the sphere gap has recently been started at the bureau.

Quartz pillars support a heavy metal plate which has a central hole in which a light aluminum disk is hung from a balance beam. The top plate and the disk are at the same high potential as the ungrounded terminal of the potential transformer or the sphere gap under test. Guard hoops in conjunction with a guard condenser maintain sensibly vertical and parallel electrostatic stress lines in which originates the attraction of the lower grounded plate for the movable disk centered in the upper plate. This attraction is weighed by the balance and the pull is computed in volts from the dimensions of the electrometer. The present auxiliary equipment limits the voltage applied to the electrometer to 150,000 because of lack of space, but the electrometer may be used up to 250,000 volts or possibly higher.

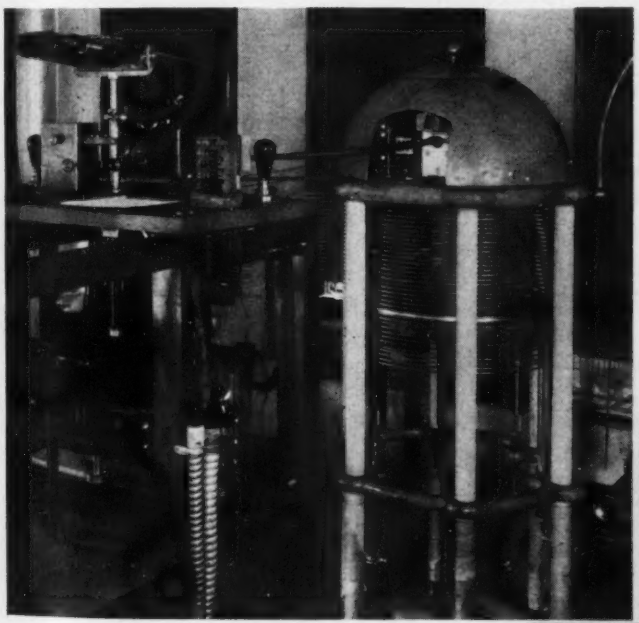


Fig. 2—150-kv. electrometer weighs volts in calibrating potential transformers

Guard condenser plates (behind operating platform) connected to guard rings of electrometer control flux distribution. Balance, leveling and centering mechanism under shield dome. Pillars are of quartz for insulation.

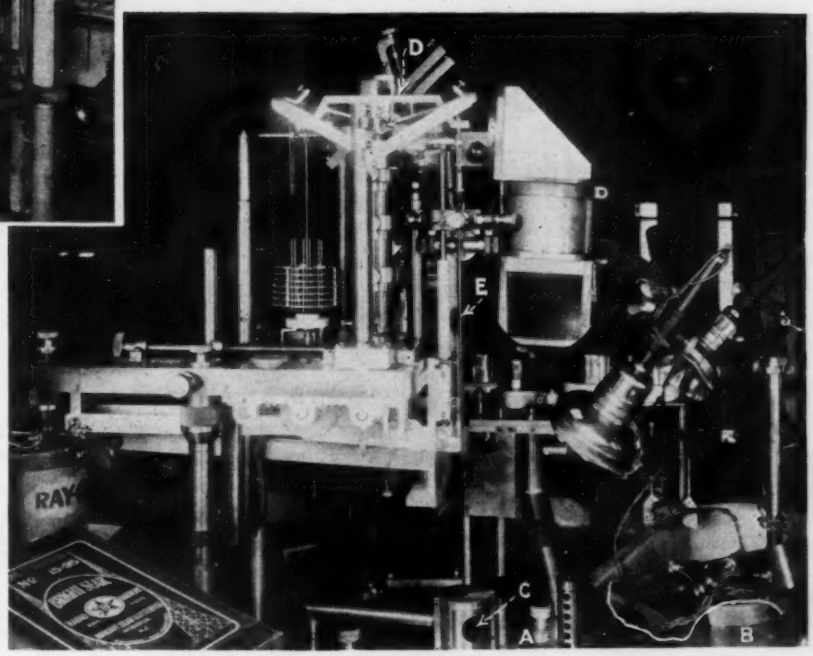


Fig. 3—Intricate mechanism for controlling and reading electrometer

Suspended attraction disk (under cover at *A*) is centered with 0.3-mm. clearance in hole in top plate (*B*) by four-point electrical contacts (at *C*) so that balance (*D*) can weigh the electrostatic attraction through suspension (*E*).

Distance-Relay Tests Simplified

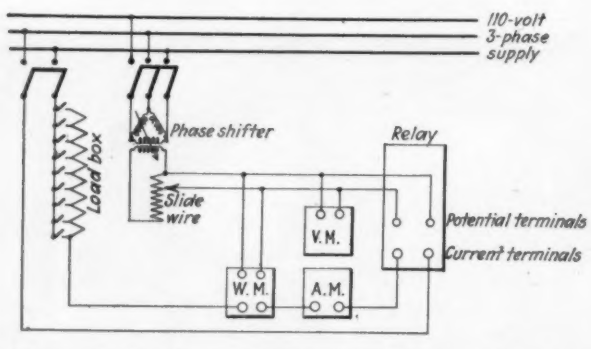
By H. H. SPENCER
Protection Engineer,
New England Power Engineering & Service Corporation, Boston

The widespread interest which has recently been developed in rapid clearing of short circuits has led to the increasing use of high-speed relays of various types. One type which has come into rather general use is the high-speed reactance or distance relay. This relay trips the breaker after a time which is dependent upon the distance between the breaker and the short circuit, the distance being measured by the circuit reactance. In one type of relay the tripping occurs without time delay if the reactance is less than a given value. An adjustable time delay frequently set for about half a second is introduced if the reactance is greater than the value for instantaneous tripping and less than a second value above which tripping occurs only as a back-up measure after some considerable delay.

In testing relays of this type the New England Power Engineering & Service Corporation has found that the use of the phantom circuit shown saves much time and requires less testing equipment than former constructional methods. The current and potential circuits of the relay are energized from separate sources analogous to the current and potential transformers from which they operate when in service. The magnitude of the current is adjusted by a load box and the potential is adjusted both as to phase and magnitude by the phase shifter and slide wire. A simple slide rule operation converts the readings of the voltmeter, ammeter and wattmeter into ohms reactance measured by the relay. The relation is:

$$\text{Ohms reactance} = \frac{\text{Volts}}{\text{Amps.}} \times \sin \cos^{-1} \frac{\text{Watts}}{\text{Volts} \times \text{Amps.}}$$

It is thus possible to check the operation of the relay for impedances of any magnitude and phase angle and

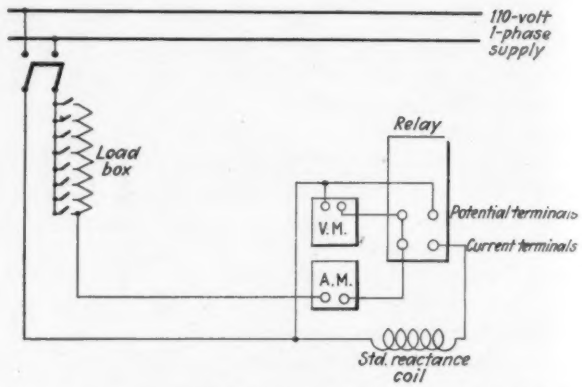


Phantom circuit connections for distance relay tests

at any value of current. This is a feature of some importance in distance relays of the reactance type since the tripping time is supposed to be governed by circuit reactance alone and should be independent of the resistance and of the magnitude of the short circuit current.

The prior conventional method, still useful and approved by the relay manufacturer, requires the use of standard reactance coils. Such coils have to be handled with care or their reactance will change and several are required to test the relay over its complete range. Further, a fundamental error is introduced in this method; the potential coil measures the drop across the current coil (as shown in Fig. 2) or else the current coil measures the current taken by the potential circuit. This error may be of the same order of magnitude as the reactance being measured.

An additional advantage of the phantom circuit is its



Previous conventional test circuit, still included in standard practice

flexibility. This permits the testing of each relay at the critical points where the operation of the relay changes from one time zone to another. These points of transition are, in general, at different values of reactance for each set of relays, and were standard reactance coils used, a separate coil would be required for each relay setting on the system.

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Electric Pasteurization Found Effective

Results of experimentation with electrical pasteurization in the neighborhood of Prague have been received from Dr. W. Lulofs, manager of the Gemeente-Electriciteitswerken, Amsterdam, Holland. Plants for Lucerne and Buenos Aires are in preparation, he reports.

The electric pasteurization apparatus is available either for operation at high voltages (3,000–10,000 volts) or on low voltage (220–380 volts) and in capacities of 200–4,000 liters or more per hour. The equipment is designed for three-phase operation and so the load unbalance will not exceed 10 per cent. To assure safety at the high voltages the milk supply and discharge pipes are grounded. The apparatus can be used with or without regeneration. For economy the milk can be warmed by waste heat up to 60 deg. C. and thereafter pasteurized electrically at 70 deg. C. The energy required depends on the beginning and end temperatures of pasteurization. For pasteurization up to 70 deg. C. with regeneration about 35 kw.-hr. is required per 1,000 liters of milk, Dr. Lulofs declares.

According to a report on research regarding the "Electropasteur" system, performed by the Preussische

Versuchs-und Forschungsanstalt für Milchwirtschaft at Kiel, very favorable results have been obtained with electrical pasteurization, as the following comments will reveal:

1. From a general bacteriological viewpoint a sufficient decrease of the number of bacteria takes place with temperatures of 65 deg. C.

2. With temperature above 65 deg. C. coli-bacilli are killed.

3. The reaction of the "Electropasteur" system on the relation between acid-forming and non-acid-forming bacteria is extraordinarily favorable, with the result that electrically pasteurized milk may become sour, but cannot putrefy when preserved too long.

4. The tubercle bacilli are completely killed at 70 deg. C.

5. After treatment at 70 deg. C. the milk shows the reactions of raw milk.

This favorable result is attributed to the thermal and electric influence of the current on the bacteria.

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READERS' FORUM

Economics Means More Than Balancing Dollars

To the Editor of the ELECTRICAL WORLD:

The excellent engineering article "Economic Balance Between Steam and Hydro," by Messrs. Irwin and Justin, in the issue of August 20, 1932, might have been more satisfying if the writers had ventured into underlying social economics so as to include the probable effects upon other industries and utilities, such as mining and transportation companies, carrying this study down through the several avenues of related labor, trade and natural resources. If such an excursion had been made it should have brought out interesting data concerning the economic reactions in other industries and in labor.

When comparing hydro with steam generation the ratios between capital charges and operating charges usually show a large spread. Obviously then, labor, both directly and indirectly, obtains larger opportunities from one than from the other. On the theory that all capital is the surplus offspring of labor, should not labor be given first consideration as a primary objective?

Economic balance in the employment of labor and capital in projects under consideration, so far as the general effect upon society is concerned, is usually omitted from consideration in any purely engineering study. If considered at all, it is generally disposed of by the declaration that consequential unused or displaced man power or capital, as the case may be, will be absorbed by other industries.

My primary object is to draw attention, if possible, to the general economic fundamental that society as a whole is largely dependent for its contentment and prosperity upon a proper balance in the employment of capital and labor in industry. The example under discussion, while not in the controlling class of industries, has elements that might, if taken in the large sense, dictate a decision in favor of steam generation even though the engineering study favors hydro.

The question of fuel conservation is, in my opinion, a matter that stands on different ground and need not be considered here. The general and substantially final effect upon existing society as a whole must be considered in the real evaluation of any project. May not the policy of the greatest number of men employed per dollar invested be better than the opposite policy of the largest dollar investment per man employed? Either policy will fail to the extent that any willing worker cannot find employment.

The wages of capital should fall before the wages of labor are lowered, since the purchasing power of labor is essentially the most important employer of capital. From this it follows that industrial development (including power projects) that employs capital in preference to labor, because of its relative current cheapness in a given project, may not in the long run contribute most to the general prosperity of our people.

W. H. COLE,
Superintendent Street Engineering Department.
Edison Electric Illuminating Company of Boston.

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I.E.C. Proceedings in English

To the Editor of the ELECTRICAL WORLD:

Among your Book Reviews of September 3, I notice that the proceedings of the International Conference on Large High-tension Electric Systems are listed as published in French. Possibly you will be interested to know that we have secured them in an English translation, which is published by the conference at the same address. We have thus far received only the papers, in two volumes, at a price of 250 francs, but a third volume of discussions is promised at 150 francs if sufficient subscriptions for the English translation of the stenographic notes are received.

KATHARINE MAYNARD,
Massachusetts Institute of Technology — Vail Librarian.
Cambridge, Mass.

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Advocates Fusing Voltage Transformers

To the Editor of the ELECTRICAL WORLD:

The findings in the article "Fusing of Voltage Transformers" in the July 23 issue of ELECTRICAL WORLD confirm the ideas we had formed from the requests received by us from utility engineers. While fuses and resistors have unquestionably caused trouble at times, we feel most decidedly that the hazard from omitting fuses greatly outweighs the uncertainties that attend the use of fuses, which uncertainties, moreover, are being reduced by improvements in fuses and similar interrupting devices. It is our practice, therefore, to recommend in all cases the use of both primary and secondary fuses. This apparently is in line with what developed from your correspondence with utility engineers.

C. A. POWEL,
Manager Generating Station Engineering.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

BOOK REVIEWS

Management of Small Municipal Lighting Plants

By Frederick L. Bird. Publication No. 28, Municipal Administration Service, 309 E. 34th Street, New York, N. Y. 141 pages. Price, cloth, $1.50; paper, $1.

A comprehensive study has been made of the 51 municipally owned and operated light and power systems of New York state, ranging from the Jamestown enterprise (45,000 population) to fifteen in towns of 1,000 or less. It analyzes the peculiar administrative problems of the municipal department and discusses their financing and rate policies, records and accounting, operating statistics, the proprieties of regulation and the desiderata of successful management, all buttressed with a profuseness of supporting data. Not always a characteristic of municipal literature, in this instance, however, the loyalty to the pure research motive has not been subordinated to bias on the issues. The sources of weakness in administration are handled without faltering. Utility management, whether private or municipal, will find much food for thought and action in this report.

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Rewinding Small Motors

By D. H. Braymer and A. C. Roe. McGraw-Hill Publishing Company, 330 West 42d Street, New York, N. Y. 256 pages, illustrated. Price, $2.50.

This second edition has been revised and brought up to parallel with new developments in small motors. The especially new feature is the appendical inclusion of operating characteristics and constructional details of the capacitor motor applied to small household, commercial and industrial appliances. Elimination of radio interference from motors is another new topic.

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Elektrotechnische Messkunde

(Electrical Measurements)

By P. B. Arthur Linker. Julius Springer, Linkstrasse 23-24, Berlin. 619 pages, 450 illustrations. Price, 31.50 reichsmarks.

Discussing in each case the theory of the method, this text, now revised in its fourth edition, describes a great variety of electrical measurements, including some involving the application of such modern devices as electron tubes and several types of high-frequency oscillographs. Numerous references are given to additional theoretical and descriptive material in technical literature.

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Theory of Dielectrics

By A. Schwaiger, translated by R. W. Sorensen. John Wiley & Sons, Inc., 440 Madison Avenue, New York. 480 pages, illustrated. Price, $6.50.

This is a textbook and an engineering treatise on dielectrics. It is outstanding as a comprehensive and thorough treatment of a new and important aspect of engineering. Fundamental theory is supported by experiments and is applied to insulators, cables, bushings and conductors. It gives data apparently unknown to many engineers and controverts many ideas that prevail about dielectrics and dielectric tests. For example, it says that flashover voltages are affected greatly by current density and that insulation stresses in solid and liquid dielectrics are measured by effective values of applied voltages and not by peak values. This book should receive a hearty welcome and a wide use among engineers and in engineering colleges.

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Vibration Prevention in Engineering

By Arthur L. Kimball. John Wiley & Sons, Inc., 60 Broadway, New York. 140 pages, illustrated. Price, $2.50.

Practical aspects of vibration and noise control arising in the design of General Electric Company's machinery prompted the assembly of mathematical and physical approaches to the problems as presented in this book. Particularly devised for the "test-course" students in advanced engineering, it will be of direct value as a fundamental reference work for practicing engineers.

Elasticity and inertia are incorporated into flexural and torsional vibrations. Critical speeds and middle-bearing reaction (in three-bearing sets) are analyzed. The epidemic of turbine disk failures of a decade ago is explained. Solid, viscous and elastic damping of vibration in noise elimination are also set up theoretically and practically. Line conductor vibration is not discussed, nor is the elimination of tooth, ventilation and core noises.

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Circulation of Heat Transmission

By Margaret Fishenden and O. A. Saunders. H. M. Stationery office, London, England. Price, 10 shillings.

During the past ten or twenty years numerous papers describing specialized experimental investigations on heat transfer have appeared in the technical press of different countries. The British Fuel Research Board considered that it would be a useful work to reduce this scattered literature to a more systematic form, to examine the best methods of correlating the available data and to ascertain in what directions further experimentation was most urgently required. The present book is the result.

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Elektrische Lichtbogenschweissung

(Electric Arc Welding)

By Karl Meller. S. Hirzel, Leipzig. 398 pages, 374 illustrations. Price, paper, 26.00 reichsmarks; bound, 27.80 reichsmarks.

Designers of metallic structures and machines, as well as technologists responsible for the actual execution of arc welding, should find this treatise decidedly useful. Central station power salesmen may find in it suggestions to be called to the attention of customers in the machine building and repair industries. The material has been revised and expanded from the first edition, published in 1925.

The book takes up hand and automatic welding, weld characteristics, technique, description of types and practical applications illustrated by numerous diagrams and views, non-destructive tests (inspection, acoustical, X-ray, radium, electrical, magnetic), specimen tests to destruction, and other aspects of the subject. In recognition of recent rapid developments there are chapters on design and on economics and cost estimating, with data, formulas and charts.

Men of the Industry

F. Norcross New President Rocky Mountain Division

Fred Norcross, who was elected president of the Rocky Mountain Division of the National Electric Light Association (ELECTRICAL WORLD, September 24, page 388), has been identified with the Home Gas & Electrical Company of Greeley, Colo., since 1913, at the

present time occupying the position of vice-president and general manager. When he started his public utility career in 1889 it was not with the light and power branch, but as a telegraph operator. Later he became a train dispatcher with the Union Pacific Railroad, afterward chief dispatcher for the Colorado & Southern Railroad, and then chief dispatcher and trainmaster and subsequently assistant superintendent of the St. Louis & San Francisco Railroad.

For a number of years Mr. Norcross has been active in association work in the Rocky Mountain district, as far back as 1921 having been president of the Colorado Electric Light, Power and Railway Association.

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A. L. ABBOTT, formerly engineer with the Society for Electrical Development, New York, has recently assumed the duties of engineer of the uniform legislation department of the National Electrical Manufacturers' Association.

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J. J. ALBRIGHT, JR., formerly manager of the power distribution central division of the Niagara Hudson Power Corporation and more recently connected with the Niagara, Lockport & Ontario Power Company at Syracuse, N. Y., has joined the Syracuse Lighting Company.

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D. D. EAMES of Lockwood Greene Engineers, Inc., has opened a consulting engineering office in Boston. Mr. Eames has been head of the steam engineering department of Lockwood Greene in Boston since 1919. He has been responsible for all power plant design, heating, ventilating, fire protection, special reports and various other problems.

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ALLEN H. BABCOCK, consulting electrical engineer of the Southern Pacific Company, has retired as of September 1 after 30 years of continuous service with that organization. In the course of a useful and interesting career, Mr. Babcock has been identified with the steel, electrical manufacturing, electric power, electric railway and the railroad industries. Mr. Babcock is a member of the American Association for the Advancement of Science and a fellow of the American Institute of Electrical Engineers.

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H. S. Bennion Assumes New Executive Duties

Major H. S. Bennion, whose appointment to the position of assistant executive director of the National Electric Light Association was announced in the October 15 issue of the ELECTRICAL WORLD, became identified with that society in the fall of 1926, when he succeeded Col. William Kelly as director of

engineering. Previous to engaging in this work he had achieved a distinguished record in the Corps of Engineers, U. S. Army.

Graduating from West Point in 1912 at the head of his class, he enjoyed the same distinction in 1915 on completing his course at the Army Engineers School in Washington. He served in Texas during the border trouble in 1915, then in the Philippines and in France, both before and after the armistice. His A.E.F. services were honored by the Distinguished Service Medal, membership in the Legion of Honor and the Polish Cross of Valor. After his return to the United States he served four years as assistant chief engineer, Federal Power Commission. Later he had charge of levee construction and river control on the lower Mississippi and the Atchafalaya rivers.

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A. Maxwell New Director of Engineering, N.E.L.A.

Alexander Maxwell, new director of engineering of the National Electric Light Association (ELECTRICAL WORLD, October 15, page 543), has been connected with the association since 1923. As principal assistant to Major Ben-

nion, whom he now succeeds, he is familiar with all phases of the work of the engineering department. Prior to the World War he was employed by the Westinghouse Electric & Manufacturing Company. He also served in various capacities with a number of utilities in the New York metropolitan district. His work with the New York Edison Company included service in the electrical office, distribution engineering and direction of the general laboratories.

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BRIG.-GEN. WADE HAYES has become a director and deputy chairman of the Greater London & Counties Trust, Ltd., public utility affiliate of the Utilities Power & Light Corporation, controlling a number of British utility properties. General Hayes has been engaged in the financing of utility undertakings in Europe since the war.

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HENRY W. CAMERON, for several years merchandise manager of the Tennessee Electric Power Company's Nashville district, has been appointed supervisor of merchandise sales for the entire company system with headquarters in Chattanooga. His service record with the company dates back to 1910.

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CHARLES H. DOUGLAS has been appointed sales manager of the Industrial Products Sales Corporation, St. Louis. Mr. Douglas brings to his new executive position a background of experience in

sales work covering a period of twelve years with the Condit Electric Manufacturing Company, the Electrical Engineers' Equipment Company and the Allis-Chalmers Manufacturing Company in St. Louis territory.

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R. C. COSGROVE, manager refrigeration division, Westinghouse Electric & Manufacturing Company, has been placed in charge of the company's domestic air-conditioning activities in addition to his present duties. Mr. Cosgrove, a graduate of Carnegie Institute of Technology, joined the Westinghouse company in 1919.

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OBITUARY

FREDERICK B. SHARP, a civilian electrical engineer employed for the last twenty years by the War Department at the Panama Canal, died September 27 at Cristobal, Canal Zone. He was 63 years of age. Mr. Sharp assisted the late General George W. Goethals in directing the construction of the electrically operated locks and later helped direct their operation for some years. Though a native of New Jersey, he lived for a time in Liberty, N. Y., where he designed an electric power plant. He went to the Canal Zone in 1912.

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JOHN R. FREEMAN, internationally known consulting hydraulic engineer, past-president of the American Society of Civil Engineers and the American Society of Mechanical Engineers, died recently at Providence, R. I., at the age of 77. He was a life member of the corporation of the Massachusetts Institute of Technology and his widespread practice included many important projects, among which were the Los Angeles aqueduct, the Hetch Hetchy water supply for San Francisco, control of the Merrimac River and consulting work on the Panama Canal.

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GROVER C. SUTTON, vice-president of the General Machinery Company, Spokane, Wash., died in that city August 2. A native of Worton, Md., Mr. Sutton received his technical education at Washington College, Chestertown, Md., and at the Carnegie Institute of Technology, then known as the Carnegie Technical Schools. He was identified with the Chestertown Electric Light & Power Company and with the Westinghouse Electric & Manufacturing Company at East Pittsburgh before going to Spokane in a sales capacity for the Westinghouse company. From 1910 to 1912 he was erecting and operating engineer in saw mill electrification, after which he became purchasing agent for saw mill, logging and related operations.

New Equipment Available

Splash-proof Motor

What is said to be the first splash-proof motor to prevent entrance of water splashed at high pressure from any angle, yet adequately ventilated and built in the same dimensions as standard open motors, has been announced by the Louis Allis Company, Milwaukee, Wis.

A double baffle in an elliptical-shaped air passage in each end bell provides the protection offered by this motor. This construction, while permitting free passage of ventilating air, traps and drains water splashed into the air openings at the bottom of the elliptical-shaped chambers. Another feature is a shaft guard which breaks the force of a stream directed along the shaft extension and prevents water from entering the bearing chamber.

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A CLAMP TYPE LUG characterized by new features to cut down installation costs is announced by the Burndy Engineering Company. The compression principle used provides contact over a large cable area in close intimacy with the contact tongue of the lug. The manufacturers have prepared designs of lugs for all standard wire and cable sizes, as well as for odd combinations of angle connections for single and multiple conductors. Another advantage of this type of lug is the locking arrangement, which is designed to prevent loosening even under extreme conditions of vibration.

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TO MEET THE DEMAND for a synchronous motor-operated time switch in the low-priced field a new design has been placed on the market by the Albert & J. M. Anderson Manufacturing Company, Boston, Mass. In the switch the circuit is made and broken by mercury tube contacts. These are tilted into the on or off position by a positive spring action controlled by cams attached to the same shaft as the pointers for setting the operating time on the day-and-night dial. The mercury contacts are mounted in clips in an accessible position and may be easily taken out for inspection.

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MANUALLY AND ELECTRICALLY OPERATED AIR BREAKERS announced by the General Electric Company bear the designation AL-2 and have a field of application in the control and protection of apparatus and feeders in all fields, including buildings, industrials and power stations. They are rated up to 750 volts, 10,000 amp., and are made in single, double, triple and four-pole arrangements. Multi-pole breakers consist of two or more self-contained, single-pole units mechanically interconnected for group operation.

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Portable Stroboscopic Meter Standard

To make meter testing as simple as setting a timepiece, a portable stroboscopic meter standard that, it is claimed, brings laboratory accuracy into field testing and can be used for testing any make of meter has been announced by the Westinghouse Electric & Manufacturing Company. In meter testing the problem is to obtain an accurate comparison of two meter disk speeds, one disk speed being that of a standard meter and the other that of the meter under test.

The meter consists essentially of two main parts combined into an easily carried unit, a portable precision watt-hour meter complete with dials and pointers suitable for conventional meter testing and stroboscopic equipment providing advantages entirely new in meter testing.

The stroboscopic principle of operation utilizes the phenomenon of a uniformly rotating device, illuminated by a series of instantaneous flashes, appearing stationary if the rate of flashing is equal to the rate of rotation, moving forward if the rate of rotation exceeds that of the flashes and moving backward if the rotation is slower than the flashing.

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A FRACTIONAL HORSEPOWER MOTOR with a built-in capacitor is announced by the Howell Electric Motors Company, Howell, Mich. Some of the features of this motor are that it is compact and neat in appearance, quiet in operation and suited for standard equipment on electrical appliances for the home and assures smooth, quiet starting under any load prescribed by Howell engineers.

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TERMINAL BLOCKS which it is claimed will do all that the old-style terminal boards and isolation switches can, plus providing a ready means for cutting instruments into the circuit, are announced by the States Company, Hartford, Conn. Some of the advantages claimed for the block are: To cut an indicating instrument or artificial load into circuit, simply attach the leads to both terminal and drop the link; link clearly indicates closed or open position; positive contact, etc.